Industrial Programmes for the Fourth Plan Rajasthan

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National Council of Applied Economic Research
New Delhi

PRINTED IN INDIA
AT KUMAR PRINTERS, DELHI AND PUBLISHED BY V. O. K. THATHACHARY
ADMINISTRATIVE OFFICER, NATIONAL COUNCIL OF APPLIED ECONOMIC RESEARCH
PARISILA BHAWAN, 11 INDRAPRASTHA ESTATE, NEW DELHI 1

Preface

THE ENTREPRENEURIAL ABILITY of the people of Rajasthan is well known and it has manifested itself in a number of industrial ventures set up by them in several parts of the country However within Rajasthan itself the number of uch ventures has been comparatively few also the investments made in them are of a low order Two factors have been responsible for this Firstly the State is not well endowed with ferrous minerals and fo sil fuels (except for some deposits of lignite) which are necessary for the production of iron and steel and which in turn could lead to the production of capital goods and machinery Secondly, the more important centres of consumption, whether for durable and non durable consumer goods or for producer and capital goods are located outside the State particularly, in the eastern and western regions of the country Perhaps, this latter factor might have ac counted even more than the former for the entrepreneurial class of Rajasthan moving to regions outside the State for setting up industries

The above does not mean that there are no prospects for industrial deve lopment of Rajasthan Although deficient in ferrous minerals, the State is well endowed in non ferrous minerals such as copper, lead and zinc This is fortuitous because the country as a whole is not well placed in the matter of non ferrous minerals and Rajasthan can therefore be an important contri butor of non ferrous metals required so vitally in engineering industries all over the country The exploitation of these metallic minerals has been taken up in the public sector by the Central Government Apart from this the State is also well endowed with non metallic minerals such as limestone, gypsum fluorite and also in building stones The e latter minerals are already being exploited for industrial use and there is scope for their further utilisation Industries based on agriculture and livestock resources in the State are also fairly developed They too offer scope for some expansion The State is poor in forest wealth and as such forest based industries cannot come up in any large way

In regard to the establishment of non resource based industries, it is well accepted that the scope for them lies more in centres of consumption As mentioned earlier Rajasthan does not score on this point Nevertheless Rajasthan can have certain types of non resource based industries, particularly those that do not involve large tonnage of raw materials for catering to regions

outside the State also In fact in one or two instances this has already been done as for instance the ball and roller bearing unit in Jaipur

As regards the future any blue print suggested for Rajasthan has necessarily to fit in the overall industrial development plans made for the country as a whole Normally the planning authorities at the Centre provide the necessary guidelines for industrial development of the country in the form of physical and financial targets to be achieved at the end of Plan periods The Draft Outline for the Fourth Plan brought out in 1967 by the Planning Commission had indicated the targets for achievement by the end of 1970 71 However the industrial recession that has been experienced all over the country during the last three to four years has resulted in a slackening of demand for a large number of industrial products It is now certain that the guidelines for industrial development given in the original Draft Outline of the Fourth Plan may not be adhered to Some rethinking has been done on this matter and it is in the light of these revised estimates made for the country as a whole that the Industrial Programmes for Rajasthan for the Fourth Plan have been indicated in this Report

According to the suggestions made in this Report for the industrial development in the Fourth Plan for Rajasthan if all the schemes are to be implemented the aggregate additional investment required by 1973 74 would be Rs 172 26 crores The share of the public sector investment in this total investment is Rs 100 crores Of this Rs 69 crores is accounted by the development possibilities in the metallurgical industry namely the increased production facilities for copper zinc and other non ferrous metals Associated with this the investment on mining of non ferrous metallic ores is also substantial being Rs 18 crores

Subject to the materialisation of the capacities suggested in this Report the additional net output from industries would be Rs 53 crores by the end of the Fourth Plan period Additional employment opportunities exist for about 156 600 persons

The Report has been prepared by Mr S Balakrishna Technical Director with the help of a team of officers listed in Appendix I would like to express my thanks to all of them

NEW DELHI
December 27 1968

S BHOOTHALINGAM
Director General

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1 Introduction

In the techno-economic Survey of Rajasthan completed on the eve of the Third Plan broad guidelines were provided to the State Government for advancing the economy of the State during the 10 year period 1960 61 to 1970 71 As an essential part of the overall economic development the growth possibilities in the industrial sector were also indicated These possibilities were made known by naming specifically certain candidate industries which could come up in the State The magnitudes to which these industries could be developed were also stated

Consequently in the present study directed towards drawing up an industrial programme for the State for the Fourth Plan a convenient starting point can be a review of the progress recorded in the Third Plan in respect of the industries sector with particular reference to those industries which were suggested in the Techno-Economic Survey of Rajasthan Table 1 lists the candidate industries suggested in the Techno Economic Survey The capacities recommended and the investment implications against the same have also been indicated

Against the 72 different items suggested in the Techno Economic Survey action has so far been taken only in respect of about 19 items Action has also been taken in respect of eight other industries (Table 2) which were not specifically included in the Techno-Economic Survey but comparatively speaking they are of lesser importance except for one item namely, pig iron The actions taken on these 27 industries, however as will be seen later, are

mainly confined to taking up industrial licences for setting up the capacities

The industries that were suggested in the Techno Economic Survey were based on considerations such as (a) the anticipated overall demand in the country by 1970 71 for the different items (b) the achievements that had already taken place at the time of the Techno Economic Survey both in and outside Rajasthan and (c) the material and other resources available in Rajasthan

The industries recommended for Rajasthan were considered technically and economically feasible in the State and were both of resource and non resource based nature

The interest evoked even in respect of the resource based industries has not been high in the State and the actual implementation much less Setting up non resource based non traditional industries in any location is fully justified if there is adequate demand for the production of those industries both within and outside the area However generally speaking the setting up of such industries also calls for bold action from either the entrepreneurial class or Government For some reasons these industries have not evoked interest in Rajasthan to the extent anticipated but the fact that during the Third Plan, additional production facilities for non resource based industries have been developed well in other States is clear indication that there was demand for these products in the country

The poor industrial progress recorded in the Third Plan in Rajasthan has naturally several economic implications Taking up first the implications of investment it is estimated that the total investment that would have been made in industries in Rajasthan during the Third Plan would not be more than Rs 27 41 crores[1] which is only 11 5 per cent of the total investment stated in the Techno-Economic Survey for the industries sector It is true that the investment figures in the Techno-Economic Survey cover both the Third and Fourth Plan periods but judging from the pattern of investment in industries sector in the country as a whole an investment of atleast Rs 74 6 crores could have been reasonably expected in Rajasthan during the Third Plan Analysing the investments made in the Third Plan in industries in Rajasthan it is seen that as much as Rs 11 40 crores is accounted by Central Government projects In other words the estimates for the private sector investment in industries is only Rs 16 01 crores

The only inference that can be drawn from the above situation is that while the entrepreneurial ability of the people of Rajasthan is well known as the

[1] This does not include investments which might have been made in the Third Plan on schemes continuing from the First and Second Plans

same has manifested itself in industrial development in other States they have not for some reasons directed their attention to setting up industries in Rajasthan itself

The more important implication resulting from non implementation of the industrial schemes recommended in the Techno Economic Survey is its effect on the secondary income According to estimates made by the Rajasthan Government, the contribution from mining and manufacturing activities have increased from Rs 102 29 crores in 1960 61 to only Rs 132 24 crores in 1965 66 Therefore during the whole of the Third Plan the increase in the income from the manufacturing activities has been only of the order of Rs 29 95 crores This is very much below what was anticipated in the Techno Economic Survey In that study an overall increase of Rs 118 65 crores was anticipated by 1970 71 over the actual net output in 1960 61

Another economic implication is connected with employment Data are not available but it is fairly correct to say that the additional employment opportunities created in the Third Plan were much less than what was fore seen in the Techno Economic Survey The shortfall in employment is not only in respect of direct employment in industries but it should have affected indirect employment also for instance in trade and services consequent on poor industrial growth

The above general review of the industrial progress during the Third Plan in Rajasthan clearly shows that (*a*) if the State is to adequately cover some ground lost in the past in the field of industrial growth and (*b*) to take its rightful place in the industrial picture of the country at least by the end of the Fourth Plan a bolder industrial programme is warranted for the future

Approach for Development During the Fourth Plan

Planning for future industrial development in any State can be based on one or more of the following approaches

(*a*) Increasing the contribution of the industries sector to the State income

(*b*) Bridging the gaps between demand and supply at national and State levels for manufactured products

(*c*) Achieving maximum employment in the industries sector

The above mentioned approaches are not mutually exclusive They are in fact interdependent as will be seen later To begin with the chief objective in all development programmes is to bring about an *improvement in the State s economy* Therefore the industrial programmes should be so drawn as to contribute the maximum to the State income But these programmes

cannot be divorced from what has been stated under (b) above That is, the programmes in the various industries should be such that they go to meet the national and regional demands for the different products The national demands for industrial products are usually spelt out in the form of production targets by the end of the Plan period The presently proposed Fourth Plan, ending with 1973 74 is still in formulation stages and firm targets are not yet known in re pect of various indu trie However the National Council in a recent study of theirs (November 1968) namely Long Term Projections for Iron and Steel carried out on behalf of the Ministry of Steel Mines and Metals had to do an independent exercise in regard to future growth possibilities for the country as a whole not only in industries sector but in other economic sectors as well These possibilities have been stated in terms of targets for different industrial products The various suggestions made in this Report in regard to industrial development possibilities in Rajasthan have emanated primarily from these national targets Wherever possible rough estimates of the demand arising within the State have also been made so that the extent to which the products manufactured in Rajasthan can find markets within its own geographical area can be gauged

As regards the third factor namely achieving maximum employment through industrial programmes it is well known that the growth in factory type of industries can only contribute in a modest measure to employment opportunities Optimum additional employment can perhaps be secured best by a happy combination of the more labour intensive cottage and rural industries sector with the modern factory sector An example of this sort of combination is the small power looms in the textile industry for which yarn is supplied by modern mills Therefore to the extent possible the growth possibilities of the small industries in the State have also been examined It however remains that the whole problem of employment has really to be viewed from the country s overall problems It is well known that certain other sectors of the economy as for instance the construction sector can provide comparatively a large measure of additional employment Therefore it is not wholly correct to expect that industrialisation of a region will solve the unemployment problem fully

After due consideration of the three factors mentioned above, a programme for specific industrial development possibilities in Rajasthan has been drawn up in this Report *The chapter immediately following gives* an aggregate picture of the development set out in detail in sub equent chapters of this Report. A consolidated picture of the investment employment potential, net output power and transport requirements for the suggested developments is also presented in Chapter 2

2 Aggregate Picture

THE ECONOMIC IMPLICATIONS of the industrial possibilities in Rajasthan during the Fourth Plan period as it emerges from the present study is presented in Table 3 in aggregate terms A summary is reproduced below

(a)	Aggregate investment (Rs crores)	172 26
(b)	Additional net output from industries by 1973 74 (Rs crores)	53 42
(c)	Additional employment opportunities (Numbers)	156 640
(d)	Additional power requirement for industries (kW)	272 150
(e)	Additional transport requirements (Million tonnes)	1[illegible] 413

The above figures of course, have significance only if the various suggestions made in this Report either for setting up of new candidate industries or expansions in the existing units are implemented In view of the rather modest progress recorded during the Third Plan in Rajasthan in the industrial sector it is hoped that the State Government will take all possible steps to carry out the development suggestions made in this study

The economic implications given in aggregate form in the previous paragraph may now be examined in some detail to identify the fields in which greater scope exists so as to enable the State Government to concentrate their efforts first in these areas

Aggregate Investment

The aggregate investment of Rs 172 26 crores is made up as shown in the table on the following page

		Rs crores
(a)	Mining industry and mineral development	27 17
(b)	Metallurgical and metal based industries	68 89
(c)	Mineral bas d industries non metallurgical	27 23
(d)	Industries based on agriculture livestock and forests	16 95
(e)	Chemical and allied industries	26 02
(f)	Small industries	6 00
	TOTAL	172 26

It will be seen that the metallurgical and metal based industries account for the largest share of the investment Out of the total of Rs 172 26 crores Rs 68 89 crores or 40 per cent is accounted by the metallurgical industry, largely for the development of copper zinc and other non ferrous metals As a necessary corollary to the suggested development in metallurgical industries it follows that the investment on the mining of non ferrous metallic ores should be substantial This is so as out of the total of Rs 27 17 crores for the mining industry Rs 18 crores is for copper lead and zinc

The remaining Rs 9 17 crores investment for mineral development relates mainly to non metallic minerals like lignite limestone fluorite etc The overall figure of Rs 27 17 crores for mineral development ranks third among the six groups of industries

Ranking number two in investment figures are the non metallurgical mineral based industries accounting for a total investment of Rs 27 23 crores Out of this as much as Rs 25 6 crores is for cement and allied products Other capacities suggested in this group are glassware micanite, etc, and from the investment point of view are relatively less important

Coming next is the investment in chemical and allied industries with a total of Rs 26 02 crores The bulk of the investment in this group is taken up by the fertilizer industry The capacities suggested for the phosphatic fertilizer call for a total investment of Rs 14 50 crores The remaining investment in this group is shared by the alkalis plastics pigments industries and synthetic detergents

The agricultural livestock and forest based industries account for only Rs 16 95 crores In this group textiles account for as much as Rs 8 40 crores The rest are for agricultural processing industries such as sugar, oil milling, etc woollen mills and chip and straw board industries

The small scale industries account for about Rs 6 crores of which the major share is for modern small scale industries coming under the Factories Act

As the gestation period for many of medium and large industries is usually two to three years it is obvious that if the capacities suggested for expansions

and for new units are to materialise before 1973 74, the entire sum of Rs 172 26 crores should really be invested during the first three years of the Fourth Plan period Should there be any lag with regard to this, the same would be reflected in the level of output anticipated from industries at the end of the Fourth Plan to which a reference will be made in the next section

One other important aspect with regard to investment in industries is the relative share between the public and private sectors and within the public sector the contributions by the Central and State Governments Table 4 has indicated this split up for the various expansions and new capacities suggested in this Report in the different industries It will be seen that of the total amount of Rs 172 26 crores, the public sector investment is of the order of Rs 100 20 crores which is about 58 5 per cent of the total Of the investment in the public sector the Central Government s share is Rs 88 50 crores and is accounted by the following projects

1 Copper mining
2 Copper smelter
3 Zinc smelter
4 Lead zinc mining
5 Machine tools
6 Phosphatic fertilizers

Hitherto the Rajasthan State Government has not been a major investor in industrial ventures According to the original Fourth Plan Memorandum for Rajasthan, the State Government had made a provision of only Rs 5 crores for investment in industries According to present indications State Government s share may be of the order of Rs 12 crores

The private sector investment amounting to Rs 72 06 crores is relatively small compared to other States like Maharashtra West Bengal and Madras Rajasthan is the home of many enlightened individuals who have made their mark in industrial opportunities outside the State The entrepreneurial ability of these people should now be directed to contemplate investment in industries in Rajasthan itself

The estimate of additional investment of Rs 172 26 crores are all at 1960 61 prices In actual practice, it is possible that this figure would be exceeded because of the continuing tendency for price increase in capital goods and equipment The increase may be of the order of 15 to 20 per cent in which case the actual investment during the Fourth Plan may be roughly of the order of Rs 200 crores at prices that may be current in 1973 74

Additional Net Output

The aggregate net output of Rs 53 42 crores indicated in the summary is the additional secondary income which may accrue to the State as a result of the suggested development in the industrial field during the Fourth Plan Obviously this additional output can result only if the schemes which have been suggested are taken up Further if the realisation of the full additional output is to be expected in the final year of the Fourth Plan namely 1973 74 it is necessary that the additional production facilities suggested must be created well in advance In other words, the investments for them should have been made well ahead This has also been pointed out in the previous section

A break up of the additional net output by industry group is shown below

		Rs crores
(*a*)	Mining industry and mineral development	10 00
(*b*)	Metallurgical and metal based industries	15 97
(*c*)	Mineral based industries non metallurgical	6 48
(*d*)	Industries based on agriculture livestock and forests	7 80
(*e*)	Chemical and allied industries	6 40
(*f*)	Small industries	6 75
	TOTAL	*53 42*

The largest contribution of the additional output will be from the metal lurgical and metal based industries The figure is Rs 15 97 crores nearly 30 per cent of the total The higher contribution from this group of indus tries is of course in consonance with the higher share in the total investment also Nevertheless the larger contribution from this group is also due to the fact that in this group the value added per rupee invested is usually much more than in the other groups

The contribution from the mining industry ranks second Additional net output from mining industry is expected to be Rs 10 crores

The other four groups of industries (*a*) based on agriculture livestock and forests (*b*) chemical and allied industries (*c*) small industries and (*d*) non metallurgical mineral industries are all expected to contribute very nearly the same amount

Additional Employment Opportunities

A break up of the employment potential for the additional output by industry group is as follows

		Numbers
(a)	Mining industry and mineral development	15 200
(b)	Metallurgical and metal based industries	15 200
(c)	Mineral based industries non metallurgical	13 700
(d)	Industries based on agriculture livestock and forests	25 500
(e)	Chemical and allied industries	7 040
(f)	Small industries	80 000
	TOTAL	*156 640*

The larger share of the employment potential (additional) arises from the small industries sector It is well recognised that small industries are less capital intensive than large and medium industries and the employment opportunities are also more Among the remaining groups the group of industries based on agriculture livestock and forests account for the largest share followed by the metallurgical and metal based industrie and mining industries

Additional Power Requirements

The additional power requirement of 272,150 kW is not by any means large and appears to be well within the planned growth of power contemplated by the Rajasthan State The relative shares of the various groups in the total requirement of power is as follows

		kW
(a)	Mining industry and mineral development	40 000
(b)	Metallurgical and metal based industries	31 750
(c)	Mineral based industries non metallurgical	52 700
(d)	Industries based on agriculture livestock and forests	51 800
(e)	Chemical and allied industries	55 900
(f)	Small industries	40 000
	TOTAL	*272 150*

Additional Transport Requirement

Consequent on the suggested development in the various industries during the Fourth Plan the transport system in Rajasthan will be called upon to transport additionally 12 413 million tonnes of raw materials and finished goods The relative shares of the different groups of industries will be as follows

		000 tonnes
(a)	Mining industry and mineral development	8 000
(b)	Metallurgical and metal based industries	311
(c)	Mineral based industries non metallurgical	2 514

(Continued)

(Contd from page 9)

(d)	Industries based on agriculture livestock and forests	[illegible]
(e)	Chemical and allied industries	[illegible]
(f)	Small industries	[illegible]
	TOTAL	12 415

Findings and Conclusions

The findings and conclusions emerging from the present study on the industrial possibilities of Rajasthan during the Fourth Plan period can be summarised as below

1 Rajasthan is deficient in ferrous metallic minerals and in fossil fuels This is certainly a handicap as the development of large scale production of basic ferrous metals and the resulting development of heavy engineering industries based on iron and steel cannot be contemplated in the State

2 The State is however having fairly adequate reserves of some important non ferrous metallic ores This is fortuitous because the country as a whole is deficient in non ferrous metals and Rajasthan can therefore be an important contributor of these scarce materials

3 With regard to other resources the agricultural and livestock position in the State are fairly good to support industries based on them

4 Having due regard to the resources position in the State a number of candidate industries were suggested in Techno Economic Survey of Rajasthan completed on the eve of the Third Plan However the progress achieved in the Third Plan in respect of these suggested industries has been modest

5 A review of the individual schemes that were recommended in the Techno Economic Survey of Rajasthan shows that there has been insufficient interest in setting up industries in the State particularly for non resource based industries

6 The State Government has perhaps failed to evoke adequate interest in the people of the State to set up large and medium scale industries The greater share of the progress achieved in the Third Plan in the industries sector is accounted by industrial ventures of the Central Government

7 Naturally the modest progress in industries in the Third Plan has its economic implications The secondary income from industries has not increased by more than 10 per cent (at constant prices) during the Third Plan whereas in several other States the recorded increases are much higher

8 Employment both directly in industries and indirectly in trade and services resulting from industrial growth have not been much

9 The overall situation in Rajasthan at the end of the Third Plan points out clearly the necessity to contemplate a bolder industrial programme for the Fourth Plan period in order to make up the ground lost by the State in the field of industries in the past

10 It must however be emphasised that while industrial schemes can be drawn up in a bold manner their implementation is much more vital and this calls for definite measures particularly by the State Government

11 The most important measure that appears necessary is to set up a proper Industrial Development Board for the State with sufficient powers to take prompt and early decisions wherever these are necessary for bringing about the desired industrial development As at present constituted, the Industries Department of the State Government appears to be concerned primarily with the development of non household and household small scale industries While these sectors no doubt deserve adequate attention in the interests of the future development, it is equally important to develop large and medium industries particularly for basic products because these can in turn support a number of other industries

12 The primary function of the Board will be to create a proper investment climate in the State This can be achieved by giving adequate publicity to the industrial possibilities suggested in this Report together with making available project profiles and reports based on pre investment studies

13 The entrepreneurial ability of the people of Rajasthan is fairly well known because the same has manifested itself by the industrial development that has taken place in other parts of the country Efforts should be made to interest these entrepreneurs in the setting up of modern large and medium industries in Rajasthan

14 Subject to the above measures being taken and the setting up of the industries suggested in this Report it is expected that the State s economy will be benefited additionally to the tune of Rs 134 crores by the end of the Fourth Plan Also the additional employment opportunities would be of the order of 156 640

3

Mineral Development and the Mining Industry

RAJASTHAN is a land locked State extending over approximately 338 000 square kilometres in the western part of north India Physiographically the State is dominated by the extensive desert area in the north west and the Aravalli ranges cutting across the entire length of the State from north east to south west

Geologically the terrain in the south eastern regions of the State is comprised of ancient igneous metamorphic and sedimentary rocks belonging to the pre Aravalli (granites and banded gneissic complex) Aravalli Delhi and Vindhyan systems Jurassic and tertiary sediments dominate the north western desert areas

The State is endowed with a wide variety of mineral resources important among the metallic minerals being lead and zinc copper and silver and gypsum mica limestone steatite and fluorite among the non metalliferrous minerals The State also has extensive resources of diverse rocks suitable for use as building and decorative dimension stones like sandstones and marbles

The deficiency is in the field of mineral fuels Coal is not found and the known reserves of lignite are small However the State has a fairly large sedimentary terrain which is being explored for oil and gas

Lead zinc silver ore among the metals mica gypsum limestone and steatite among the non metallic minerals emeralds among precious stones and sandstone and marble dimension stones for the building construction industry constitute the more important minerals currently produced in

Rajasthan Lignite is the only mineral fuel now mined Among the other minerals raised are iron and manganese ores asbestos barytes bentonite, calcite chinaclay, dolomite feldspar, fullers earth, garnet, ochre, quartz and silica and vermiculite

In 1964, the value of minerals produced in the State was of the order of Rs 9 2 crores (Table 5) representing an increase of 41 per cent over Rs 6 5 crores in 1960 Nearly two thirds of this increase is accounted by the growth in the production of minor minerals

In terms of the all India production Rajasthan s share has been under 4 per cent as will be seen from the following production figures

Year	*Value of minerals produced in Rajasthan expressed as per cent of all India output*
1960	3 97
1961	3 61
1962	3 74
1963	3 29
1964	3 82

In terms of values of the minerals produced Rajasthan ranks seventh after Bihar, West Bengal Madhya Pradesh Andhra Pradesh Orissa and Uttar Pradesh But the State s importance in mineral production lies in the fact that it is the sole producer of lead zinc silver ores and emeralds also, Rajasthan takes the first place in the production of gypsum feldspar steatite, asbestos and minor minerals and the third place after Bihar and Andhra Pradesh in the production of mica Limestone is another mineral raised in substantial quantities in which the State ranks fifth The relative shares of some of the important minerals produced in Rajasthan in terms of all India s production are shown in Table 6 for the year 1964

In 1964, there were 328 operating mines [1] These included 134 mines for mica, 63 for steatite 18 for limestone, 17 for feldspar and 13 each for silica and garnet In 1965 66 825 mining leases were in force against 592 in 1960 61 However outside of the limestone quarries for cement, gypsum lignite and the bigger quarries for marble and about a sixth of the mica mines mechanization is not evident The bulk of the mining operations are small and worked intermittently

Among the mineral based industries in Rajasthan are three cement factories at Sawai Madhopur Chittorgarh and Lakheri one glass factory, one mica brick factory in Bhilwara two grinding plants—one in Bhilwara Bhupa and the other at Jaipur, and four ceramicware plants, one each at Jaipur Udaipur Bharatpur and Mandal

[1] *Annual Report of the Chief Inspector of Mines for the Year 1964*

There are a number of mineral grinding units at Nim ka thana Udaipur, Bholma Dausa Alwar Khemli Bhinder Ajmer Sri Mahavirji and Narainpur Tatwara where steatite calcite, barytes and quartz are pulverised Marble polishing is done at Makrana, Ramganjmandi Chittorgarh, Alwar Kishengarh and Maonda The lapidary industry in Jaipur is a well known one

The State s Department of Mines and Geology operates the lignite mine at Palana, a limestone quarry at Patan in Sikar district a brick burning unit in Hanumangarh and a dimension stone quarry at Bhankri Recently, the department has been working the alluvial wolfram deposits around Degana The department has proposals to develop an open cast mine to produce half a million tonnes of lignite at Palana the Mando ki pal fluorite deposit and a polishing unit for statuary granite

The scope for the future development of the different minerals of Rajasthan will be discu sed individually in the following sections

Mineral Fuels

While *there are no coal deposits in* Rajasthan a *number* of lignite occurrences are known in Bikaner and Barmer districts Exploration for oil and gas is underway in the Jaisalmer area

Lignite

Lignite occurrences have been reported from Palana Khari Channeri Gangasarovar and Mudh in Bikaner and Gunga and Underor in Barmer Of these the Palana deposit is the most important and is being worked by *the State Department of Mines and Geology*

At Palana the lignite is found beneath an over burden consisting of

	Metres
Sand	0 6— 3
Kankar with ferrug nnous nodules	15—21
Weathered sandstone and clay	6—12
Fullers earth with limeston inter calations	15—21
Shales w th friable sandston	3— 9
TOTAL OVERBURDEN	*40—66*

The lignite is underlain by a bed of clay grading into sandstone Two separate productive areas as the old and new separated by a barren patch have been distinguished in this field In the old area which is being worked the lignite has an average thickness of 7 metres with a lignite to overburden

ratio of 1 9 as against a 3 4 metres thickness of lignite with a ratio of 1 13 to the overburden in the new area

Both the areas have been proved by the State Department of Mines and Geology The tonnage of lignite available is 10 43 million tonnes in the old area after allowing for a 25 per cent deduction for material already moved and 8 44 million tonnes in the 'new area

More recently, another 4 5 million tonnes have been proved, further west in Khari Village, 35 kms north west of Bikaner

The Palana lignite is being worked departmentally by underground methods Production since 1959 is shown below and reflects the impending closure to facilitate the proposed open cast mining

Year	*Production* (In tonnes)
1959	24 818
1960	4? 224
1961	56 687
1962	35 07?
1963	4 544
1964	1 20?
1965	11 200
1966	7 200

Underground work has been beset with great difficulties in this field and arise out of bad roof conditions necessitating extensive and expensive roof supports, swelling of the floor and inflammability, with the result that recovery runs to about 20 per cent only

The development of an open cast mine in the old area at Palana with an annual production of 500 000 tonnes of lignite was envisaged in the Third Plan as a State project but little progress has been made so far The lignite was to have been utilised partly for power generation and partly for fertilizer manufacture at Hanumangarh as well as to provide fuel for brick kilns, etc Perhaps the decision to use naphtha as a source for the nitrogenous fertilizer and to locate the plant at Kota instead of Hanumangath may have cast doubts on the need to develop this lignite project Discussion with the State authorities indicate that a power station based on lignite is likely to set up only in the first half of the Fifth Plan

Lacking adequate resources for power generation hydel or otherwise, Rajasthan has been depending heavily on hydel projects in the neighbouring States of Madhya Pradesh and Punjab [1] The successive failure of the monsoon during the last two seasons in the Chambal Valley had led to a serious curtailment of power availability in the State

[1] The State is served by two power systems the Chambal Jodhpur and the Bhakra Nangal systems the hydel supplies from Madhya Pradesh and Punjab being augmented by a few thermal stations.

No doubt the implementation of the 200 MW nuclear power project near Kota and participation in Satpura Thermal Power Project in Madhya Pradesh to the extent of 125 MW would ameliorate the situation. But in view of the heavy and increasing power demands in Delhi Haryana and Punjab it would be desirable to bolster the grid's capacity to weather the vagaries of monsoon failures by generating power from the lignite source available within the State itself. It is therefore suggested that the lignite based thermal power station contemplated for the Fifth Plan be set up in the Fourth Plan itself to utilise the entire planned output of half a million tonnes of lignite.

The lignite to overburden ratios in the Palana field are rather high 1 9 in the old area and 1 13 in the new area. In such cases underground gasification of lignite should be considered as an alternative. However the old area having been partially worked is not suitable for such techniques and open cast mining has to be adopted. In view of the above the speedy implementation of the open cast mining scheme in the old area at Palana along with a thermal power station at the mine site in the Fourth Plan becomes a must for Rajasthan. The open cast mining scheme has been estimated to cost Rs 3 crores.

Exploration for oil and gas has been resumed and drilling is to be undertaken in the Jaisalmer area and it is possible that oil and/or gas may be found. But unless large quantities of gas are found it may not be wise to use the same for power generation fertilizer production is to be preferred.

This would indicate that exploration for lignite should be continued particularly to find areas with favourable lignite to overburden ratios. Alternately trial underground gasification in the new area at Palana may be instituted and may require another Rs 50 lakhs.

Petroleum and Gas

Sedimentary rocks occur in Rajasthan over an area of 120 100 square kilometres in the western parts of the State. Exploration for oil and gas is going on in this potential area.

Metallic Minerals

Copper

Copper is a widely used metal. It has high electrical conductivity high heat conductivity and good corrosion resistance it is strong yet malleable and ductile and alloys readily with many other metals.

In Rajasthan old copper workings are found in a number of places, of which, the Khetri Singhana tract in Jhunjhunu district appears to be the most important, others worthy of note are Kho-Dariba in Alwar and, Delwara Kerovli and Debari in Udaipur

Khetri Singhana The copper belt is about 64 kms long but current investigations have been mainly centred around the Madhan and Kudhan hills and more recently in the Kolihan and Akwali hills The lodes occur in phyllites at the top at depths the host rock is hard, massive compact and often grades into a quartzite

In the Madhan and Kudhan sections the average tenor of the ore runs about one per cent copper metal 52 million tonnes of ore of this grade have been proved in these two sections, with another 60 million tonnes of probable reserves[1]

A 20 ton run of mine ore sample from these two sections sent to the National Metallurgical Laboratory analysed[2] as follows

Chemical analysis	(Per cent)	*Mineralogical analysis*	(Per cent)
Cu	0 80	Chalcopyrite	2—2 3
Fe	18 63	Pyrrhotite	6—7
S	3 08	Pyrite and Marcassite	0 56—1 0
SiO_2	54 65	Magnetite	5—6
Al_2O_3	9 62	Siliceous	
Mgo	4 54	Gangue	86 44—83 7
Au	0 13 dwt/tonne		
Ag	2 37 dwt/tonne		

In the Kolihan section about 10 million tonnes of 2 per cent copper have been indicated, proving operations are underway

Daribo The revaluation of survey and mapping work of Indian Bureau of Mines by the National Mineral Development Corporation has proved reserves of 278,900 tonnes of 2 485 per cent copper ore and possible reserves of 131 700 tonnes of 2 45 per cent copper ore

Some of the other occurrences like Pratapgarh and Jodhawas in Alwar and, Delwara and Kerovli in Udaipur are under investigation

Currently there is no production of copper ore in Rajasthan The development of the Madhan Kudhan sections of the Khetri belt as a project under the National Mineral Development Corporation, was included in the Third Plan This envisaged originally a mine, a beneficiating plant together with a smelter and refinery to produce 10 000 tonnes of electrolytic

[1] Mira L. N.—Khetri Copper Project—*Eastern Metal Review* Annual Number 8th February 1963 p 87

[2] National Metallurgical Laboratory CSIR—*Annual Report* 1962 63 p 21

copper annually. Subsequently, on the advice of the Corporation's consultants, the production target was raised to 21,000 tonnes of the metal per year. There has been considerable delay in the implementation of this project mainly due to lack of a specific tied foreign aid.[1] However, work on the production and ventilating shafts has been taken up.

The project after the enlarged scope as approved by Government in September 1966 is an integrated one to include 31,000 tonnes annually of electrolytic copper metal (21,000 tonnes from Khetri mines and 10,000 tonnes from Kolihan mines), 600 tonnes of sulphuric acid daily as a by-product to be utilised for production of 214,500 tonnes per year of triple super phosphate. At a later stage, recovery of the precious metal values, viz., gold and silver, are also to be undertaken.

The acute shortfall in the availability of copper in the country cannot be called an unforeseen one. Despite this, no effort was made to divert about Rs 9 crores worth of foreign exchange to a copper project from other untied sources even though about Rs 25 crores is spent in a year for the import of the metal. This is a matter for regret. However, France has offered foreign aid specifically for the Khetri project to the extent of $ 18 million.[2] The representatives of the French Group visited India during March to April 1967 for discussions on technical and other details. A substantial order for supply of equipment has been placed in France. A contract for general engineering services signed with the French Group came into force on the 30th June 1967.

In an earlier Report the NCAER had the occasion to comment on the unprofitability of working low grade ores below 2 per cent metal content by underground methods.[3] The situation has changed since then. The price of copper has risen the world over and is expected to continue so for some time at least. It is also reported that at the current price levels deposits with an average copper content of 1.25 per cent are likely to be profitable. The price of scrap copper in the Calcutta market[4] is as shown below:

	Per tonne (In Rs)
Copper scrap clean (Wire)	11,500
Copper scrap mixed	10,900
Copper scrap utensils	10,800

[1] The initial offer of an aid by the U.S. was withdrawn subsequently.
[2] *Eastern Metal Review*, 29th November 1965, p. 1297.
[3] NCAER, *Techno-Economic Survey of Rajasthan, Appendix: Report on Mineral Resources* (Unpublished).
[4] *Eastern Metals Review*, 9th September 1968, p. 853.

The free market price of copper is still higher in India At such levels the Khetri project is definitely profitable

Another factor to be taken into account now is the acute shortage of foreign exchange facing India In such a context even if a loss were to be incurred it would be purely on a rupee basis and yet about Rs 8 crores worth of copper and sulphur (equivalent of sulphuric acid) both of which are in short supply and constitute strategic commodities would be available from a domestic facility, which would otherwise have to be imported

The seemingly unprofitable nature of this project would improve its profitability in due course if certain aspects of the scheme are taken up in the second and subsequent stages These aspects are

(a) Recovery of precious metal (gold and silver)

(b) Recovery of fluorine and possibly uranium and vanadium from the rock phosphate which would be used to manufacture triple superphosphate

While the first of these has already been contemplated by the project authorities the by product recoveries suggested under (b) above might also be looked into Rock phosphate usually contains about 3 to 4 per cent fluorine Some like the Florida and Western rock phosphate in the U S contain 0 01 to 0 02 per cent uranium and 0 40 to 0 70 per cent vanadium [1] Recovery of fluorine compounds[2] is already being done in a few plants elsewhere in the world, as in the following [3]

> In Rumania at Turnu Magurele, 4 000 tons of fluorine compounds are being recovered from a fertilizer plant At Oesterreichische Stickstoffwerke, aluminium fluoride is made from hydroflurosilicic acid recovered from their superphosphate plant At Des Plaines Chemical Corporation Illinois flurosilicic acid is recovered from wet process phosphoric acid plants, approximately 325 lb of 25 per cent flurosilicic acid is obtained per ton of P_2O_5 and used as an additive to drinking water

Uranium recovery from rock phosphate is not economic except as a by product of phosphoric acid manufacture to date, five companies in the U S are reported to recover uranium from this source [4,5]

[1] U S Bureau of Mines 1960 *Mineral Facts and Problem* Bull No 585 p 635

[2] Some aspects of such recovery are also discussed in Waste Recovery and Pollution Abatement a CE Report *Chemical Engineering* September 1965 pp 144 145

[3] Fatkin G 1965 Fluorspar Mining Annual Review *Mining Journal* London May 1965 p 81

[4] *Modern Chemical Processes* Vol (Asian Students Edition) Asia Publishing House 1966 pp 102 112 (Greek B *Fatal Uranium Recovery and from Wet Process Phosphoric Acid*)

(Please see footnote 5 on next page)

Though the technical feasibility of recovering vanadium from this source has been known for some time[1] it is only recently that the economics of doing so has been established It is reported that such recoveries would yield low cost vanadium from rock phosphate of the Intermountain West, U S from existing phosphorous operations [2]

While the above discussion has indicated the possibilities of increasing by product recovery in the Khetri Project, the recoveries of uranium and vanadium would depend on the rock phosphate used Hence it would be desirable to obtain relevant analysis of rock phosphates from various sources If, ultimately it is decided to proceed with the recovery of uranium and vanadium, a long term contract will have to be entered into to ensure a continued supply

To conclude in the present context of acute shortage of copper in India it is imperative that the Khetri Copper Project be completed expeditiously The development of mines and mills to beneficiate ore in the Madhan Kudhan and Kolihan sections would entail investments of Rs 9 5 crores and Rs 3 5 crores respectively

Lead Zinc Silver and Cadmium

Rajasthan has an important lead zinc ore bearing tract in Udaipur in the neighbourhood of Zawar Old workings and slag heaps are to be seen in the hillocks of Zawarmala Balaria Baroj and Sonaria Of these, the lodes in the Zawar hills are being exploited and provide the entire small current output of lead and zinc concentrates in India

The principal ore minerals are galena and sphalerite with pyrite and some chalcopyrite Dolomitic limestones constitute the host rocks for the dissemi nations stringers and veins of ore

In the Mochia property which is currently being worked the total metal (lead and zinc) content of ore now won is reported to be about 7 8 per cent with cut off at 4 per cent The ore grades are expected to be lower in the future, at around 4 5 per cent lead and zinc, with cut off at

(Footnote from previous page)

[5] The Firms are ( ) Blocks on Chemicals (now owned by Olin Mathieson)
(ii) International Minerals & Chemical Corporation
(iii) Texas City Chemicals Inc
(iv) U S Phosphoric Products Div of the Tennessee Corpn
(v) Virginia Corolina Chemical Corp)

[1] U S Bureau of Mines 1965 Mineral Facts & Problems Bull 5?, p 635

[2] Mining Annual Review Mining Journal London 1965 p 51

2 per cent Reserves in this property are reported to be as follows

	Million tonnes
Blocked and proved	8
Drilled and indicated	16
TOTAL	24

Another 11 6 million tonnes are indicated in the adjoining two properties but in these two, the ore is predominantly a zinc ore around 8 per cent in zinc and 0 05 per cent in lead The ore is also reported to contain about 25 per cent pyrite

Other reported occurrence mainly for lead are Rakhabdeo and Katar in Udaipur, Chouth ka Barwara in Sawai Madhopur and Joper Piara and Turangi in Sirchi Exploratory work is in progress in these areas, the second of these is being investigated by the State Department of Mines and Geology, where the indications so far, are reported to be promising

At present the Zawar deposits consisting of the Mochia Mine and the adjoining hills are under lease to the Hindustan Zinc Ltd So far, mining has been restricted to the Mochia hill where a production of 166 000 tonnes of run of mine ore has been reached in 1967 Production and treatment data are furnished in Table 7 alongwith the metal content of ore and concentrates Treatment rate in the mill is of the order of 150,000 tonnes per year, producing separate lead and zinc concentrates Metal recovery was stated to be 92 per cent for lead and 86 per cent zinc The concentrates assay about 73 per cent lead and 55 per cent zinc in the respective concentrates Besides lead and zinc, small amounts of recoverable silver and cadmium are also found The following detailed assays are available

	Lead concentrate	*Zinc concentrate*
Silver Oz/tonne	[illegible]	[illegible]6
Lead %	74 0	0 9
Zinc %	6 5	54 [illegible]
Iron	1 5	4 8
Insolubles %	—	1 [illegible]
Cadmium %	—	0 23
Arsenic %	—	0 04
Antimony %	—	0 0[illegible]
Sulphur %	16 0	32 0

SOURCE —Indian Bureau of Mines *Base Metal of India* Bulletin No 1

The lead concentrates were shipped to the Company's lead smelter at Tundoo in Bihar where it is smelted Along with lead, silver is also recovered

as a by product Outputs of lead and silver in 1960 66/67 have been as follows

Year	*Lead metal* (In tonnes)	*Silver metal* (In kgs)
1960	3 745	3 768
1961	3 664	5 572
1962	2 849	3 941
1963	3 537	3 680
1964	3 624	4 383
1965 66	2 532	2 806
1966 67	2 514	1 425

The zinc concentrates were exported on a toll basis and the metal got back

During the Third Plan the Company had a proposal to increase the mine output and mill capacity to 2 032 tonnes per day install a zinc smelter to produce 18 288 tonnes of zinc metal a year recover 29 464 tonnes of sulphuric acid to be converted into 76 200 to 81 280 tonnes of single super phosphate per year recover 71 to 76 tonnes of cadmium and expand the lead smelting capacity to 10,160 tonnes along with a silver recovery of 11 220 kgs per year The zinc smelter complex at Debari near Udaipur and the expansion of the lead smelter at Tundoo in Bihar have been taken up

India lacks sufficient resources of all non ferrous metals except aluminium In respect of lead and zinc the Zawar deposits in Rajasthan are the most promising among all the known occurrences of the ores of these two metals Therefore while efforts are being made to set up smelters based on imported lead and zinc ores it is hoped that for the zinc smelter at Debari near Udaipur in Rajasthan and the lead smelter at Tundoo in Bihar the development of the mine and mill at Mochia to mine and treat 2 800 tonnes of run of mine ore per day would be carried out within the next two or three years An investment of about Rs 2 5 crores is likely to be required for the expansion of the mine and the mill

In terms of the estimated consumption levels by 1973 74 of lead and zinc indigenous capability is likely to fall far short efforts should, therefore be made to prove the present indicated 11 6 million tonnes of 8 per cent zinc ore in the Balaria and adjoining hill and develop a mine, mill and smelting facility for another 18 000 20 000 tonnes of zinc metal production per year a provision of Rs 2 5 crores may be made for further proving and the development of a mine and mill to produce and treat 300,000 tonnes of run of mine ore per day About 60 000 to 65 000 tonnes of pyrite could also be recovered as a by product from the mill operation, based on the present indication of 25 per cent pyrites in the ore

IRON ORE

The more important occurrences found in Rajasthan are in Jaipur and Udaipur Compared to deposits elsewhere in India, these deposits are of course small The deposits are hematitic in character, those near Morija, Nimla and Dabla in Jaipur are richer in iron as compared to the deposits around Daralmata and Amiswali in Udaipur

Division	*Location of deposit*	*Fe content* (Per cent)	*Reserves* (In million tonnes)
Jaipur	Morija	64—68	10 0
	Nimla	67	1 0
	Dabla	—	Several small deposits
Udaipur	Daralmata, Amiswali	48—52 [a, b]	11 36

[a] Sethi M L *Mineral Resources of Rajasthan* Deptt of Mines and Geology Govt of Rajasthan (1964 65)

[b] Another source places the Fe content at 4 50 per cent Rekar C F and Zakrajsek J—*NMI Technical Journal* Vol VI No 2 May 1964 p 35

The deposits in Rajasthan are being worked manually, and the ore exported through Kandla Port over a distance of 825 860 kms Production over the last few years has been a follows

Year	*Production* (In tonnes)
1959	93 835
1960	125 425
1961	85 033
1962	86 285
1963	67 079
1964	35 087
1965	12 200
1966	300

These days, the world market in iron ore has become highly competitive, the last decade has seen the development of a number of new sources, particularly, in West Africa and more recently in Australia With the increasing competition, attention is being focussed on large deposits close enough to deep sea port In this context, the rather small deposits in Jaipur division, situated more than 800 kilometres from the nearest port, are not likely to be profitable The Udaipur deposits are closer but they are low grade and, need beneficiation to bring them up to marketable grades which would be feasible for large deposits

MANGANESE ORE

Though manganese ores are found in Rajasthan the occurrences cannot be compared with those found in Madhya Pradesh Maharashtra Bihar or Orissa Within Rajasthan the more important occurrences are found in Banswara

The Indian manganese ore industry is primarily an export oriented one and with the decline in exports subsequent to 1958 mining activity in the *relatively poor or more inland deposits like those of Rajasthan mine has* suffered a setback The production of manganese ore in Rajasthan from 1960 to 1966 is given below

Year	*Tonnes*
1960	5 608
1961	3 861
1962	2 826
1963	Nil
1964	1 062
1965	4 600
1966	7 900

Even though as a result of a special barter deal with the U S, exports have increased to 1 6 million tonnes in 1964, future exports can be envisaged only at a level of about 1 3 million tonnes a year Therefore no appreciable activity is anticipated in this particular sphere of the mining industry in the State in the immediate future

WOLFRAM

Wolfram is the principal ore of tungsten By reason of its use in special steels tungsten assumes strategic importance So far known occurrences of this mineral are confined to two deposits one in Rajasthan and another in West Bengal

The Rajasthan occurrence is at Rewat 4 kms west of Degana where the mineral occurs in association with fluorite pyrite chalcopyrite, mica topaz triplite and leibethinite The ore is found as a primary stockwork in granite and the intruded phyllite and as a secondary alluvial *placer in the neighbourhood of the hill The average tenor of the primary* ore is about 0 5 per cent WO_3 while that of the secondary alluvial pay dirt is variable Although the ore is free from cassiterite, tin oxide from 0 38-2 75 per cent has been recorded in analysis of the wolfram This deposit is being investigated by the Indian Bureau of Mines

This wolfram deposit has been worked intermittently in the past Because of the emergency' the State Department of Mines and Geology has

again started working the alluvial pay dirt and recovering the wolfram by hand picking It is understood that the Department is making a provision of Rs 27 lakhs for this operation provisionally Results of the current investigations are awaited before the details of the scheme can be worked out

Other Metals

Among *other ores of metals* likely to be of economic importance are antimony with lead ore in the old lead mines at Taragarh near Ajmer, cassiterite at Paroli in Bhilwara and Soniana in Udaipur and Columbite tantalite in pegmatites in Ajmer Udaipur and Bhilwara These need to be explored further

Non Metallic Minerals

Fluorite

Fluorite known commercially as fluorspar is the principal fluorine bearing mineral Natural cryolite which has a higher fluorine content used to be the major source but, supplies are dwindling The most important use of fluorite is in the manufacture of hydrofluoric acid and, then, synthetic cryolite and aluminium fluoride for the aluminium industry various fluorine compounds and as a catalyst in the production of high octane fuel Next in order, is its use as a flux in steel making followed by uses in the glass and enamel industries

In Rajasthan fluorite occurrences have been found at Mando ki pal and Salumber in Dungarpur, Asind in Bhilwara, Chowki in Sikar and Chokri Chapoli in Jhunjhunu Of these the Mando ki pal *deposit* has been proved to have a reserve of 1 5 million tonnes of stone with CaF_2 content of 17 18 per cent, another 0 8 million tonnes is stated to be probable The Salumber deposit is under *investigation* now

A few hundred tonnes of hand sorted fluorite is produced annually from the State since 1961

Year	*Tonnes*
1961	212
1962	340
1963	358
1964	-24
1965	2 000
1966	1 510

The development of the Mando-ki pal deposit was one of the schemes included in the State Third Plan However, so far the project has been

processed only to the extent of getting a feasibility report by a Canadian firm of Consultants a detailed project report and design for the mill to mine and treat 300 tonnes run of mine stone per day to produce 5 135 tonnes of acid grade and 9,510 tonnes of flux grade spar per year is to be prepared

Recently a larger fluorite deposit of a grade better than the Mando ki pal deposit has been discovered in the neighbourhood of Amba Dungar in Gujarat The Amba Dungar deposit has a reserve of 11 6 million tonnes of which more than 40 per cent is stated to average about 50 per cent CaF and, the rest 20 per cent CaF_2 This is in comparison with the 2 3 million tonnes of proved and probable reserves with 17 18 per cent CaF_2 at Mando ki pal As such it would appear that recovery of the less stringent[1] flux grade spar would be more economic for a low grade deposit like the Mando ki pal one and yield a larger proportion of saleable to treated material It is therefore suggested that Mando-ki pal deposit be developed to mine and treat 300 tonnes of run of mine stone per day and produce 16 000 tonnes of flux grade concentrates per year in the Fourth Plan The mine and mill facilities are likely to require an investment of Rs 80 lakhs

Gypsum

Rajasthan ranks first in production of gypsum in India[2] This is to be expected since 94 per cent of the known gypsum reserves of India is found in Rajasthan

Reserves of Gypsum

State	*District*	*Reserves* (In million tonnes)
Rajasthan	Bikaner	80 30
	Ganganagar	0 25
	Jaisalmer	*1 30*
	Jodhpur	39 10
	Nagaur	813 00
	SUB TOTAL	*933 95*
Andhra Pradesh		1 00
Gujarat		6 70

(Continued)

[1] Specifications are *Acid grade*—95 98 per cent CaF_2 Silica 1 5 per cent maximum Calcium Carbonate 1 5 per cent maximum Sulphur 0 per cent maximum *Flux grade* 85 per cent CaF_2 Silica 6 per cent maximum and 0 3 per cent sulphur maximum
[2] Eighty six per cent in 1964

(Contd from page 26)

Jammu & Kashmir	40 00
Himachal Pradesh	0 40
Madras	15 60
Uttar Pradesh	0 0
TOTAL	998 45

The bulk of the reserves in Nagaur occur at depths[1] in two basins one around Dhakuria on the north and the other around Nagaur town in the south In the northern basin the gypsum horizons occur below 75 and 166 metres and in the southern basin below 126 metres

So far production is restricted to the surface deposits and has crossed the one million tonne mark in 1962

Year	Tonnes
1960	914 7 8
1961	7?9 881
1962	1 033 742
1963	1 08 929
1964	758 191
19?5	1 039 200
1966	1 153 400

Since the surface is bedded gypsum is admixed with clay and sand it is hand sorted to give high grade material above 80 per cent $CaSo_4$ $2H_2O$ Two grades are produced—a fertilizer grade containing 83 to 86 per cent $CaSo_4$ $2H_2O$ and a cement grade with 80 83 per cent $CaSO_4$ $2H_2O$ Gradewise, the production in 1964 was as follows

Grades	Tonnes
Above 95% $CaSo_4$ $2H_2$	6 825
90 95 %	? 062
83-86	446 99?
80-83%	2?9 537
70-80 %	68 ?64
6? 70	8 508
TOTAL	758 191

Consumption by the Sindri Fertilizer Plant is placed at 617 000 tonnes and at 513 000 tonnes by the cement industry in the year 1964

While, in other countries substantial quantities of gypsum are consumed by the building industry as building plaster and also in prefabricated elements such a use cannot be foreseen in India for sometimes yet until, the country becomes more affluent Thus its major use must perforce be confined to the chemical and cement industries

[1]Indian Bureau of Mines *Indian Minerals Year Book* 1962

Of all the ammonium sulphate plants operating in 1964 only one at Sindri was based on gypsum. The others were using imported sulphur; gypsum was produced as a by-product in one of these, i.e. at Alwaye. It is understood that the Sindri Plant is seriously concerned at the long gypsum haul so far away from Rajasthan and is to give up the use of the same. Plans are afoot there to switch to the use of elemental sulphur to be obtained from Amjore pyrites. In the meanwhile the sulphur is to be imported.

The cement industry's consumption is likely to be around 0.9 million tonnes in 1973-74[1] against the 1964 estimated consumption of 513,000 tonnes. But the off-take from Rajasthan is likely to be around 700,000 to 800,000 tonnes a year by 1973-74 if allowance is made for an increase in production from other States in India. The production in 1964 from the rest of India stands at just more than 124,000 tonnes which may be expected to increase to the level of 150,000 to 200,000 tonnes. This increase is anticipated from additional mining and from increased recovery from bitterns during the extraction of salt from sea water.

The above indicate that the market for Rajasthan gypsum in 1973-74 is likely to be at a level of some 200,000 to 300,000 tonnes lower than the maximum achieved rate of production.

However, one more avenue of utilisation is still open, i.e. to manufacture sulphuric acid from gypsum with cement clinker as a by-product. Such a source is being used in England in the I.C.I. plant at Billigham.

According to one estimate, the cost of production of sulphuric acid in a 100,000 tonnes per year acid plant would be Rs 103 per tonne with credit for 100,000 tonnes of clinker.[2] On this estimate acid manufacture from gypsum would certainly compare favourably with acid from imported sulphur or pyrites (Table 8). It is seen that at inflated prices of about Rs 300 per tonne[3] of imported sulphur and an estimated price of Rs 80[4] for Amjore pyrite, acid manufacture from gypsum in Rajasthan would be cheaper. However, in view of the requirement of 2.4 tonnes of gypsum per tonne of acid against 0.9 tonne of pyrites and 0.34 tonne of sulphur per tonne of acid, locations away from Rajasthan may not be suitable.

[1] On a likely 22 million tonnes capacity requirement at an average of 4 per cent gypsum per tonne of cement.

[2] Podder, V., 1962, *Cement Industry in India*, p. 14.

[3] *The Indian Mining and Engineering Journal*, Vol. IV, No. 3, 1965, Market Review—Sulphur quotation at Rs 280-300 per tonne for rock sulphur at Bombay, p. 10.

[4] Mining cost at Rs 60 per tonne. Cost for F.O.R. rail head Rs 68 per tonne. Price at Rs 80 per tonne.

Therefore the establishment of a 100 000 tonne sulphuric acid plant in the Bikaner area would be both helpful in retaining the current level of gypsum production and at the same time be economic Besides it is also to be noted that (a) the price of sulphur is now at a high level in world markets, (b) it is also in short supply in world markets (c) India is now faced with a serious shortage of foreign exchange (d) mining conditions in the Amjore pyrite deposit are bad and it may not be possible within the Fourth Plan to develop production very much beyond the 462 000 tonne level already planned and (e) while new deposits of pyrite may be discovered elsewhere in India their development is not likely before the Fifth Plan

In view of the above there is need to tap every other possible source of sulphur for acid A hundred thousand tonnes per year production of acid from an indigenous raw material would result in a saving of at least Rs 66 lakhs worth of foreign exchange per year

While in the immediate future production may be confined to sulphuric acid (and cement clinker) later on the facility can be integrated with a phosphatic fertilizer capacity to produce single or triple superphosphate The possibility of utilizing the nitrogen in furnace gases[1] to ammoniate the phosphatic fertilizer produced may also be looked into at that stage

Thus, the possibilities of utilizing gypsum that have been discussed above indicate that the level of gypsum production in Rajasthan could be maintained at the current level of 1,100 000 tonnes during the Fourth Plan

LIMESTONE

Rajasthan is endowed with large resources of limestone occurrences are to be found among the Aravalli Raialo Ajabgarh Vindhyan and Tertiary rocks in practically all the different regions of the State These include crystalline limestones as well as sedimentary horizons Some are dolomitic and some siliceous

The following are some of the limestone occurrences [2,3,4]

[1] According to Poddar *op cit* p 138 The furnace gases in this process consist of 8 per cent sulphur dioxide 10 per cent carbon dioxide one per cent oxygen and 7 per cent nitrogen

[2] Roy B C 19 9 The Economic Geology and Mineral Resources of Rajasthan *Memoirs of the Geological Survey of India* Vol 86

[3] Sethi M L 19 *Mineral Resources of Rajasthan* Govt of Rajasthan Department of Mines & Geology Bulletin No 4

[4] Marble occurrences are shown within *brackets*

Ajmer—Gangwana (Mhar) Makhupura (Sila Dungari) (Hathi ...) (Kansapura) Sawar Kharwa Beawar Barna Hera Dulalpura Lakhtawapura Kakrara Lakasuni C... Arjunpura Mangra Nagar Srinagar
Alwar Kalyanpura Bhana Nimla Rajgarh ... Chetra ... Dulanpur Devmata Rajnagar
Banswara Khamera ...
Bikaner Nokha
Bundi Lakheri Bundi
Chittorgarh Chittorgarh Nimbahera
Dungarpur Mangre Nandli ... Dal
Jaipur Kotputli Kishangarh
Jaisalmer ... Chakhralba
Jalore Rupi
Jodhpur Jodhpur
Kota Jaipura ... Ramganjmandi
Nagaur Mundwa Makrana Gotan
Pali Sojat
Sawai Madhopur ... Mal...
Sikar ... Nim ka Thana Dalla
Sirohi Abu Road Bhatana
Udaipur Darol ... Devmata ... Rajnagar

Besides the Lakheri and Chittorgarh deposits which are being worked for cement manufacture investigations conducted by the State Department of Mines and Geology have indicated the following inferred reserves of cement grade limestones

Districts	*Deposits*	*Inferred reserves* (In million tonnes)
Chittorgarh	Chittor Sandi	117.85
Sirohi	Abu Road	253 [illegible]
Udaipur	Darch	13
Jaipur	Kotputli	[illegible]
Bundi	Kesarpura near Bundi	132 [illegible]
Pali	Near Beawar	2 3 [illegible]
Sikar	Nim ka Thana	[illegible]
Sikar	Dalla	10-12

Besides extensive quarrying of the Vindhyan Nimbahera limestone in Chittorgarh and Kota districts limestone is being worked for cement making and lime Production of limestone since 1960 has been as follows

Year	*For cement fertiliser etc*[a]	*For lime making*[b] (In tonnes)
1960	1 588 902	18[illegible] 8[illegible]0

(Continued)

[a] Indian Bureau of Mines
[b] Seth M L *Mineral Resources of Rajasthan* Govt of Rajasthan Department of Mines & Geology 1964 65 p 16

(Contd from page 30)

1961	1 649 841	N A
1962	1 694 771	N A
1963	1 736 593	469 300
1964	1 717 790	N A
1965	1 820 000	N A
1966	1 715 200	N A

There are at present three cement plants in the State at Lakheri, Sawai Madhopur and Chittorgarh Together the total capacity of the three is 1 35 million tonnes per year

Tonnagewise, the major use of limestone is in the cement industry next, in order, are its uses in the iron and steel and chemical industries While Rajasthan has limestone of sufficient purity for use as flux in the iron and steel industry the large requirements for this material are in the eastern region Because of the long haul involved the present large scale iron and steel plants in the iron and steel belt are not likely to draw upon the flux grade limestone resources of Rajasthan However about 50 000 to 60 000 tonnes of flux grade limestone with low insolubles would be required by 1973 74 for the proposed pig iron plant near Udaipur and for copper smelting

Recommendations have been made elsewhere in this Report to create additional capacities of the order of 1 65 million tonnes of cement per year in the Fourth Plan of which 100 000 tonnes would be by product of the gypsum sulphuric acid plant in Bikaner

The above additional cement capacities suggested are likely to require about 2 50 million tonnes of limestone per year by 1973 74 Along with other requirements for flux and chemical grade stone additional mining capacity to be created in the Fourth Plan is envisaged at 2 55 million tonnes a year which would entail an investment of Rs 1 6 crores

Mica

There are three important mica bearing tracts in India i e, in Bihar, Andhra Pradesh and Rajasthan The mica belt in Rajasthan has a general N N E—S S W trend extending from Jaipur in the north east to Udaipur, over a distance of more than 320 kilometres The mica occurs in coarse granitic pegmatites in the gneissic complex and schists at the contacts and, associated with quartz cores of the pegmatites themselves

About 40 per cent of the total yield is of the ruby' variety but is often stained warped or cracked In some of the mines the quality of the mica improves with depth though not in all the cases Among other drawbacks are that only sickle dressing is carried out in the State, often with Bihar

labour, and then sent for further processing to Bihar As a result the Rajasthan mica industry lacks direct marketing contacts outside India

Production of crude mica since 1960 is shown below for Rajasthan along with that of India

Crude Mica Production
(In tonnes)

	1960	*1961*	*1962*	*1963*	*1964*	*1965*	*1966*
India	[illegible]	8 317	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Rajasthan	7 3 6	[illegible]	7 420	[illegible]	[illegible]	[illegible]	6 900
Rajasthan as per cent of India	25 1	[illegible]	[illegible]	27 4	[illegible]	9 6	[illegible]

Indigenous consumption being negligible the mica mining industry in India is solely dependent on export markets Exports of mica (unmanufactured) from India are given below since 1958

Year	*Quantity* (In tonnes)	*Value of export*[a] (Rs)	*Average value of export* (Rs per kg)
1958 (Jan Dec)	[illegible]	[illegible]	4 735
1959	23 189	[illegible]	4 644
1960	[illegible]	[illegible]	3 5 6
1961	[illegible]	[illegible]	[illegible]
1962	31 118	[illegible]	3 428
1963	[illegible]	8 85 52	2 509
1964	[illegible]	[illegible]	3 88
1965	37 000	1 72 00	2 978
1966	31 000	1 83 50	4 140

[a]Includes blocks splittings scrap condenser films and other mica not manufactured

It is seen that while the volume of exports has risen by about 50 per cent, i e from a level of 20 000 tonnes to a level of 30 000 tonnes the quantum of export earnings has not increased appreciably or in other words prices realised have been progressively lower

The Indian mica industry is made up of numerous small producers who have little bargaining power Consequently intense internal competition has developed among themselves with the result that they have tended to undercut each other in prices

Concerned at such a turn of events the Government of India has banned the export of mica on a consignment basis Floor prices have been fixed for the various varieties of mica An irrevocable letter of credit is to be opened in favour of the exporter before consignment is made

To sum up the mica industry in India has almost levelled off and any further significant rise in mine output or export is not to be expected

ASBESTOS

Amphibole asbestos is found in Ajmer, Bhilwara, Dungarpur Pali and Udaipur Occurrences of the chrysotile variety have also been noted and it is understood that one of these in the neighbourhood of Rakhabdeo, near Udaipur is being investigated by a private company

Chrysotile is of limited occurrence in India the bulk of the asbestos produce is of the amphibole variety Rajasthan accounts for about three fourths of the production Amphibole asbestos from the State has been tested by Messrs Powhatar Mining Co of the U S A and found not suitable for the manufacture of asbestos cement products More recently the Central Fuel Research Institute is reported to have had some success in the use of amphibole asbestos in asbestos cement sheets etc It would be desirable to test the Rajasthan asbestos at the Institute In the meanwhile, it is anticipated that the asbestos production in the State which has been increasing steadily can be expected to increase further

Year	*Tonnes*
1959	934
1960	1 033
1961	1 184
1962	1 320
1963	2 133
1964	2 411
1965	4 000
1966	5 900

A limiting factor, however is likely to be the reserves which are known only for a few following deposits [1]

Ajmer—3 000 tonnes to a depth of 15 2 metres
Bhilwara—4 500 tonnes to a depth of 30 48 metres
Jodhpur—2 600 tonnes to a depth of 15 25 metres
Udaipur—16 000 tonnes to a depth of 30 48 metres

In view of the attention that is now being paid to increasing the indigenous content of the asbestos used by the Indian asbestos cement industry it would be desirable if all the deposits are investigated and their reserves estimated

BARYTES

Occurrences of barytes the sulphate of barium are found in Alwar and Bharatpur Mining is often hampered by deterioration in grade and pinching out of veins at depth Reserves have been estimated as follows

[1] Indian Bureau of Mines *Indian Minerals Year Book* 1962 p 170

	Tonnes
Sainpura	1[illegible] 000
Bhankera	10 000
Khora Makrora	2 [illegible]00
Babalai	3 000
Hathori	[illegible] 000
TOTAL	80 000

Current production is mainly of the off colour inferior grades. Grinding facilities to pulverize the mineral are available at Alwar and Dausa. While production has increased from a level of 2 000 tonnes in 1959 to a level of 9 365 tonnes in 1964, 12 100 tonnes in 1965 but dropped to 7 100 in 1966 and further increases are likely in the short term, such a trend cannot be forecast on a firm basis for longer spans on account of the limited reserves.

BENTONITE

Bentonite is a plastic clay which has a capacity to swell on the absorption of water. It is mainly used in drill mud composition, foundries for moulds and for lining canals, tanks, etc. Other uses are as a bleaching clay and in paints, arc welding, etc. Gujarat, Bihar and Rajasthan followed by Uttar Pradesh in that order produce this mineral. In 1966 Rajasthan produced 5 700 tonnes. In view of its increasing use production may be expected to rise further by 1973-74.

CALCITE

Calcite is the crystalline form of calcium carbonate; when transparent it is known as iceland spar and used in optical instruments. Ground calcite is used in non-scratch metal polishes, as a filler in various industries like paper, rubber and sugar, insecticides, disinfectants and in making glazes, etc.

High purity calcite occurs in veins in Dungarpur, Jhunjhunu, Pali, Sikar, Sirohi and Udaipur districts. The State is the leading producer of the mineral in India accounting for more than a third of the total production.

Production of Calcite

(In tonnes)

Year	*India*	*Rajasthan*
1960	9 325	4 [illegible]60
1961	11 118	4 136
1962	13 907	5 5[illegible]6
1963	14 776	4 9[illegible]3
1964	13 906	4 8[illegible]3
1965	[illegible]0 481	7 886
1966	17 751	7 859

In view of the increasing requirements of mineral fillers in diverse industries, the requirement of calcite which has increased substantially in the five years, 1960 65 is expected to increase at the same rate Thus it is anticipated that all India production may reach a level of 30 000 tonnes by 1973 74 and Rajasthan s production around 10 000 tonnes

CLAYS

Clays suitable for pottery and chinaware are found at Botia in Barmer, Chandi and Mudh in Bikaner and Literiya in Pali districts Others which have been prospected by the State Department of Mines and Geology are Indo Kabala Mundhwa Diaria, Geejgarh and Eral in Bikaner Jodhpur and Jaipur The Geological Survey is investigating a promising deposit at Badrajun Besides the above fire clay occurs in association with the lignite seams at Palana Some of the clays from Bikaner and Jaipur show good plasticity

While a number of occurrences have been found as above they are not comparable in quality or size to those in Rajmahal in Bihar or those in Kerala Consequently, production of such clays in Rajasthan forms but a small proportion of the total production in India In 1966 the State s share had reached a level of about 2 3 per cent with a run of mine output of 12 825 tonnes out of a total of 554 000 tonnes for India In view of the sizeable production clays from the adjoining States like Delhi Gujarat Madhya Pradesh not to speak of large production from Bihar production of china clay in the State would be primarily for consumption internally hence it is expected that in Rajasthan the production may register a modest increase and reach a level of 20 000 tonnes a year by 1973 74

DOLOMITE

True dolomites are rare in Rajasthan Mostly, the material found is either a dolomite limestone or a dolomitic marble These are reported to be worked in Alwar Ajmer and Jhunjhunu mainly for preparing chips for the building trade

EMERALDS

Rajasthan is the solitary emerald producing State in India. The more important mines are at Bubani Chat Gudas, and Rajgarh in Ajmer and Dhalanka Guda, Gamgurha Kalguman and Tikhi in Udaipur Since the emerald occurs in pockets which are sporadic in their distribution, the production fluctuates substantially from year to year

Feldspar

The major use of feldspar is in the ceramic industry and as a source for alumina soda and potash in glass compositions in the latter use, nepheline syenites can also be used Other uses include scouring compounds etc In the last few years some quantities have been exported Exports which were nearly stagnant during the three years 1960 63 went upto 5 359 tonnes in 1965

Production of Feldspar
(In tonnes)

Year	*India*	*Rajasthan*	*Exports*
1960	10 613	8 757	1 [illegible]12
1961	10 [illegible]40	[illegible]	1 268
1962	20 238	12 1[illegible]	1 003
1963	[illegible]	14 [illegible]71	1 369
1964	[illegible]4 3[illegible]2	12 [illegible]	5 [illegible]6
1965	17 000	26 770	5 359
1966	18 000	26 004	3 641

In view of the rising internal consumption and increased exports it is likely that production in India may reach a level of 60 000 tonnes by 1973 74 of which Rajasthan s contribution may be around 30 000 tonnes

Since feldspar commonly occurs in the mica bearing pegmatites it is most economically won as a by product of mica mining industry

Fullers Earth

This is a naturally occurring belaching clay others which can be used for the same purpose are bentonite and bauxite among minerals

Rajasthan has large reserves of fullers earth in Bikaner and Jaisalmer, however production has been fluctuating during the last few years

Year	*Tonnes*
1958	7 800
1960	6 700
1962	8 400
1963	8 982
1964	7 580
1965	4 9[illegible]0
1966	11 7[illegible]0

This is probably due to the availability of others like bentonite and bauxite which can be used as effectively as fullers earth It would be useful to test the possibilities of using this material in pozzolanic cements and, to make light weight aggregates

Garnet

Though known since early times as a semi precious stone and such quality stones have been won from Rajasthan, the bulk of the material is of inferior grades suitable only for use as an abrasive Sarwar and Rajmahal in Jaipur, Phulad in Jodhpur, Maja Jahajpur, Sangna and Pur in Bhilwara and Nandisi Choti Kanei Bilia and Sarisiri in Ajmer are some of the better known garnet bearing areas in the State

Current production from Rajasthan is around 400 tonnes a year, the State being the sole producer of the mineral in India Though well known as a natural abrasive, the advent of synthetic abrasives with their extreme hardness sharpness and uniform quality precludes any appreciable increase in the requirement of natural abrasives

Graphite

Low grade graphite with 12 20 per cent fixed carbon occurs in Rajasthan at a number of places in Ajmer and Banswara A few occurrences have been noted in Jaipur and Udaipur The deposits are also small

Kyanite

Small occurrences of kyanite have been recorded in mica schists or in association with corundum in Dungarpur Jaipur and Udaipur Small lots used to be raised in the State till 1957 since then production has been recorded only in two years i e, 1961 and 1966 when 16 and 61 tonnes were produced respectively

Not only are these deposits small but the material is not of the same class as massive kyanite of Bihar

Magnesite

Magnesite has been reported from Hatondi, Sendra Soladipura and Mangali in Jaipur division Patan in Jodhpur and Sabili and Sisot in Dungarpur In Dungarpur breunnerite the iron bearing variety said to occur This is an ideal material for the manufacture of refractories and, therefore may be investigated further

Ochre

Red ochre occurs at Kanauj in Tonk about 100 000 tonnes are reported to have been won already but an equal quantity is stated to be available still Another occurrence is near Barva in Udaipur Currently small lots are being produced Appreciable increases in production are not expected

Production of Ochre in Rajasthan and India from 1960 to 1966 is given below

		(In tonnes)
Year	*India*	*Rajasthan*
1960	21 67[illegible]	43
1961	18 [illegible]3	6
1962	22 8[illegible]	14
1963	28 3[illegible]5	154
1964	32 941	16[illegible]
1965	36 [illegible]87	[illegible]73
1966	30 [illegible]03	8[illegible]

Quartz and Silica

Both quartz and friable sandstones from which sand can be obtained are found in Rajasthan Quartz is found both in pegmatites in the mica belt and also as quartz reefs Silica sand from friable sandstones occur as follows

District	*Location of deposit*	*Reserves* (In million tonnes)	*SiO_2 in sand* (In per cent)
Bikaner	Mudh	1 4[illegible]	98 [illegible]3—99 19
Bundi	Barodhia	1 16	89 40—99 34
Kota	Kundi	5 3	91 [illegible]1—9[illegible] 6
Kota	Khemaj and Shahbad	—	94 52
Sawai Madhopur	Sawai Madhopur	0 110	96 53—97 [illegible]0
Sawai Madhopur	Narauli	—	N A
Jaipur	Jhia	1 0	90—95

Production of quartz and silica sand in the State has been steadily increasing from 17 458 tonnes in 1958 to about 50 000 tonnes in 1965 The material produced is consumed in the glass factories within the State and also despatched to consumers in other States, the latter accounting for the bulk of the demand The same pattern of utilization may be expected to continue and it is likely that the production may go upto about 120,000 tonnes by 1973 74

Steatite

Rajasthan is the most important steatite producing State in India and *accounted for 84 per cent of the total production in 1966*

Vermiculite

Vermiculite is akin to mica and has the property of exfoliation It finds use in light weight insulation refractories Current requirements have been

estimated at a thousand tonnes per year However the total production from Rajasthan and Andhra Pradesh has been well below this level

Gudas Rajgarh Kaklana, Lachipura Barla Hatundi Chat, Mangalwas, Ajassan and Razipura in Ajmer are the vermiculite bearing areas in the State About 60,000 tonnes of the mineral are stated to be available in these occurrences Production began in 1962 in the State, 61 312, 50, 174 and 129 tonnes being produced in 1962, 1963, 1964, 1965 and 1966 respectively

BUILDING STONES

Rajasthan is an important producer of dimension stones of sandstone marble and limestone for use in building construction Their distribution is shown below.[1]

Geological horizon	*Type of stone*	*Important occurrences*	
Aravalli system	Schistose quartzite	Jaipur	Toda Rai Singh
			Bhankri
			Chitoli Jaisinghpura
	Marble	Sirohi	Bhatana
		Jalore	Rupi
Raialo series	Marble	Alwar	Jhiri
			Dadampur
			Devimata
			Rajnagar
		Jaipur	Kishengarh
		Sikar	Maonda
		Nagar	Makrana
Delhi system	Quartzite phyllites	Jaipur	Amagarh
		Alwar	Mehtawas
			Kaysa
	Slate	Alwar	Kund
Vindhyan system	Sandstone	Jaipur	Kotri Jaggar
		Kota	Karauli
			Modak
			Bundi
			Karauli Lateri
			Bharatpur Pundbareta
			Dholpur Sri Mathura Bari
		Udaipur	Mandalgarh
		Jodhpur	Fidusar
			Khatu

(Continued)

[1] Sethi M L—1956 *Mineral Resources of Rajasthan* Bulletin No 4 Department of Mines and Geology Government of Rajasthan pp 60 and 127 133

Geolo ical hori on	*Type of stone*	*Important occurrences*	
		Bikaner	Dulmera
			Bidasar
	Limestone	Kota	Ramganj Mandi
			Morak Lakehri
			Sawai Madhopur
		Udaipur	Chittor
			Nimbahera
			Khodip
Jurassic	Marble	Jaisalmer	Deori Chakhradha

Besides the above there are granites and gneisses like the pink granite associated with the Malani rhyolites in Jodhpur

While the dimension stones from Rajasthan are extensively used in the neighbouring States there may be some possibilities for export of these also, e g quartzites and sandstones and marble

Quartzite/Sandstone

It is understood that there is a considerable overseas demand for hard wearing paving stones Quartzite appears to be preferred It has been reported that the output of quartzite slate by Alta Skiferbrudd A/S of Alta in the north of Norway is rising to over 8 million square feet[1] The demand is stated to be running at record levels well ahead of supplies [1] The bulk of the Norwegian exports go to Netherlands and Germany [1]

In view of this enhanced demand export of quartzite slate is to be undertaken from South Africa also and a contract is reported to have been finalised to export 100 000 tonnes of the material over a 10 year period to a Swiss company This particular quartzite from Mamaqualand in South Africa is light grey to bluish in colour and is to be supplied in a uniform thickness between 3/8 and 5/8 of an inch sawn into squares or rectangles

As far as indications go Norway Italy and South Africa are the major exporters of such quartzite paving stones While the above trade relates to quartzites similar use of sandstone slabs could also be explored in the overseas markets

Among marbles it is reported that there is a popular demand for yellow, red veined and brecciated marbles in the U S which are not produced there [3] The possibilities of exporting the yellow marble from Jaisalmer may also be looked into

[1] *Min J l* London August 27 1965
[2] *M J nal* London January 1 1965 pp 10 & 11
[3] U S Bu au of Mines 19 *Mine l Fact nd Problems* B ll t n No [illegible] p [illegible] 8

SALT

Rajasthan produces more than 400 000 tonnes of salt annually and is the fourth ranking salt producing State in India after Gujarat, Madras and Maharashtra

	1950	*1960*	*1961*	*1962*	*1963*	*1964*	*1965*
India	3 177 647	3 433 677	3 [illegible]0 600	3 896 100	4 544 100	4 646 800	4 714 300
Gujarat	1 659 471	1 603 303	1 808 400	1 951 300	2 449 700	2 518 600	2 664 [illegible]00
Madras	675 044	763 [illegible]8	730 300	79[illegible] 100	867 700	919 400	[illegible]86 900
Maharashtra	373 573	439 282	383 700	414 000	462 700	481 800	441 200
Rajasthan	300 [illegible]48	307 262	[illegible]31 000	384 300	436 400	35[illegible] 800	468 [illegible]00
Rajasthan as per cent of India	9 5	8 9	7 2	9 9	9 6	7 5	9 9

Unlike the other leading salt producing areas in India where sea water constitutes the salt source in Rajasthan the brine sources are derived from inland drainage basins Of these the most important are the Sambhar and Didwana lakes Pachbadra Bharatpur Phalodi Jaisalmer Pokran, Lunkaransar are some of the other areas where sub-soil brine is obtained from wells or pits dug for the purpose

Compared to the other salts, the Rajasthan salts contain sodium sulphate and to lesser extent sodium carbonate These amount to 18 per cent in the Didwana and 2 3 per cent in the Sambhar brines A 20 tonne per day refrigeration plant to recover the sodium sulphate has been installed at Didwana

The Sambhar Didwana and Pachbadra sources are being worked in the public sector while the Phalodi Pokaran Telchapar and Kuchaman areas are being worked in the private sector

Along with additional areas to be taken up in other States like Gujarat Madras, Andhra Pradesh and Orissa sufficient salt would be available for the country s entire requirement in 1973 74

It is also to be noted that Rajasthan has already reached a level of production near what was set for the Third Plan viz 500 000 tonnes Rather than increase in the acreage further could be directed towards greater recovery of sodium sulphate in the Fourth Plan thereby improving the purity of the salt produced [1]

OTHER REPORTED OCCURRENCES

Among other occurrences are ores of antimony bismuth cobalt gold molybdenum tin and nickeliferous and uraniferous ores and apatite bauxite beryl corundum ilmenite pyrite rutile, serpentine topaz, triplite and zircon

[1] This is being discussed in the Chapter on Chemical *Industries*

Implications of the Development Programme Suggested

Rajasthan s forte is non ferrous metals While the occurrences of copper at Khetri Kolihan and Dariba and lead and zinc ores at Zawar are to be developed, there still remain a number of other occurrences to be explored in detail In this connection a reference may be made to the aerial exploration programme undertaken by the Government of India for which foreign assistance has been provided by the U S A I D However, such a programme does not eliminate follow up ground parties and it is in this context that a recommendation has been made herein for an expenditure of Rs 90 lakhs for further mineral exploration

Table 10 gives mineral wise implications of the suggested programme A summary of the same is given below

Investment	(Rs crores)	27 17
Net output	(Rs crores)	10 00
Employment	(Numbers)	15 200

4

Metallurgical and Metal-Based Industries

IN THIS CHAPTER the discussion is on the development possibilities for engineering industries which are also termed as 'metallurgical and metal based industries The discussion is by the following broad industry groups

A Basic metal industries
B Secondary products of steel and other metals
C Metal products except machinery and transport equipment
D Machinery, except electrical
E Electrical industries
F Transport equipment
G Miscellaneous industries

Basic Metal Industries

The industries in this group are

(*a*) Pig iron
(*b*) Mild steel
(*c*) Alloy steels
(*d*) Ferro-alloys
(*e*) Copper ingots
(*f*) Aluminium ingots
(*g*) Zinc ingots
(*h*) Lead ingots
(*i*) Other non ferrous metals

The above industries are largely mineral based Rajasthan is deficient in

minerals for ferrous metal production but is fortunate in having mineral resources for the production of lead, zinc (with cadmium and silver) and copper Exploitation of the minerals for production of non ferrous metals has commenced in the State in case of zinc, lead and copper

PIG IRON

At the national level the requirement of foundry grade pig iron by 1973 74 is now estimated at around 2 2 million tonnes according to the recent study by the National Council, namely Long Term Projections of Iron and Steel This demand is expected to be met as shown below

Plant	*Quantity* (In 000 tonnes)
Bhilai	330
Durgapur	300
IISCO	300
Miscellaneous	100
Barbil	100
Talcher	160
Bokaro	900
TOTAL	*2 190*

In addition to above a number of licences have been granted for production of foundry grade pig iron Even if none of these materialise the above capacities are adequate to meet the demand during the Fourth Plan period

In Rajasthan one firm Kamani Industrial Corporation Limited has been granted a licence for production of pig iron near Udaipur From available indications this licence in Rajasthan may not materialise

MILD STEEL INGOTS

As the resources position of Rajasthan either iron ore or metallurgical coal are not adequate for supporting even a fair size integrated iron and steel plant the production of mild steel ingots has to be ruled out for the State

ALLOY AND SPECIAL STEELS

The schemes coming up elsewhere in the country both in the public and private sectors for the production of alloy and special steels are considered adequate to meet the anticipated demand by the end of the Fourth Plan and as such they have not been considered here for Rajasthan Further both the availability of steel scrap and electric power in adequate quantity and favourable tariffs are problems in Rajasthan which also rule out considerations of the alloy and special steel industry in the State

FERRO ALLOYS

The above remarks for alloy and special steel also apply to this item

COPPER INGOTS

The shortage of non ferrous metals in the country emphasise the importance for the maximum exploitation of the available non ferrous metallic ores in the country The consumption of copper in India and in the world for recent years is given below

Consumption of Refined Copper[a]
(In tonnes)

Year	*India*	*World*
1962	76 491	4 997 500
1963	78 340	5 300 000
1964	65 339	5 81[illegible] 700
1965	64 000	5 96[illegible] 100
1966	60 000	6 4[illegible]0 400
1967	45 000	6 093 700

[a] *The Eastern Metal Review*

Against the consumption of about 70 000 to 80,000 tonnes, indigenous production has been only of the order of 10 000 tonnes The production figures for the past years are as follows

Production of Copper (Virgin Metal)[a]

Year	*Production* (In tonnes)
1961	8 746
1962	9 781
1963	9 587
1964	9 455
1965	9 360
1966	9 362
1967	8 900

[a] Central Statistical Organisation *Monthly Statistics of the Production*

A good deal of work is being carried out for finding out ways and means for substitution of copper by other metals like aluminium but still considering the wide gap between indigenous supply and demand there is good scope for increasing the production of copper ingots but the main obstacle is shortage of copper bearing ore

No firm estimates are available for demand of copper in the country by 1973 74 but it is not expected to be lower than 120,000 tonnes

Production of zinc in India started in middle of 1967 Previously zinc con centrates from Zawar mines in Rajasthan were sent to Japan for smelting on toll basis and the metal brought back

The import of zinc (virgin metal) alloys and products for recent years are given in the following table

Year	*Imports* (In tonnes)
1961 6	65 689
1962 63	85 476
1963-64	81 376
1964 65	71 135
1965 66	80 210
1966 67	42 031

The decline in imports are not merely due to a fall in the demand but are attributable to restrictions on imports On the basis of the present day uses of zinc in this country the demand in 1973 74 is not likely to be less than 150 000 to 200 000 tonnes However, the actual requirement may be less than this figure as substitution efforts are being made now specially in the field of protective coating—aluminising in place of galvanising Still the demand of zinc will be substantially large

Hindustan Zinc Ltd has commissioned a plant in May 1967 at Debari near Udaipur with the production capacity of 18 000 tonnes of zinc per year This plant was scheduled to come in production in the Third Plan period but due to various reasons was delayed The ore for this unit is available from Zawar Mines (Mochia Working)

Another smelter has come up in the country based on imported concen trates in Kerala (Cominco Binani Zinc Smelter) One more zinc smelter is being planned to be set up at Vishakapatnam in public sector with Polish help This is likely to come in the Fourth Plan and is also based on impor ted concentrates The combined capacity of all these including one at Debari will be of the order of 60 000 tonnes per year Even after full pro duction is achieved at these units there will still be a wide gap between demand and supply

The blocked and proved reserves and drilled and indicated reserves at Mochia Zawar Mines are of the order of 24 million tonnes Another 11 6 million tonnes are indicated in the adjoining two properties of Hindustan Zinc Ltd Prospecting is being carried out at other places In view of these deposits and shortage of zinc in country the capacity of zinc smelter could easily be increased by 18 000—20 000 tonnes per annum It is sug gested that the expansion of Debari smelter by 18 000—20,000 tonnes capa city be undertaken early

Lead

Lead is a major non ferrous metal used widely in storage batteries paper insulated lead sheathed cables pigments and compounds chemical plant printing industry and jointing for cast iron pipes The import of lead during the last few years in the country is given below

Year	*Thousand tonnes*
1960	2 3
1961	27 3
1962	34 0
1963	37 4
1964 65	34 2
1965 66	44 7

The indigenous production of lead has been as given below

Year	*Tonnes*
1965 66	2 532
1966-67	514
1967-68	1 86[illegible]

At present there is only one lead smelter in the country—Metal Corporation of India s smelter at Tundoo in Bihar The lead concentrates for this plant are sent from Zawar Mines in Rajasthan At present the capacity of this plant is 5 400 tonnes of lead per year

The ore at Mochia Mine (Zawar) contains fair quantity of lead but at the adjoining section the ore is predominantly a zinc ore—8% zinc and 0 05% lead But at Katar near Udaipur there are promising deposits of lead These are yet to be proved Work is being carried out by the State Department of Mines and Geology The lead concentrates are taken to Tundoo in Bihar for smelting involving heavy freight It is suggested that a lead smelter be put up in Rajasthan near Debari for smelting local ore—from Zawar and Katar The capacity of this smelter may be fixed around 11,000 tonnes per year The existing smelter at Tundoo may then be run on imported concentrates Tundoo is only about 290 kilometres from the port of Calcutta

Other Basic Metals

Cadmium and Silver Lead zinc ore contains cadmium and silver also At the Debari zinc smelter there are arrangements for recovery of 75 tonnes of Cadmium per year With the suggested expansion of that unit to double its capacity the recovery of cadmium will also go upto say 1[illegible]0 tonnes a year The major use of cadmium is in the electroplating industry as a rust

proof coating on iron and steel Other uses are in pigment manufacture in nickel cadmium batteries, in electrical cables and in electronic instruments industry

The import of cadmium during last few years in the country is given below

Year	Tonnes
1961 62	7[illegible]
196[illegible] 63	42
1963 64	61
1964 6[illegible]	107
1965 66	154
1966-67	58

The firm estimates of demand for cadmium in 1973 74 are not available but the expansion of zinc smelter will go a long way to wipe off dependence on imports as far as this metal is concerned

Silver is another by product of the zinc smelter Hindustan Zinc Limited is to recover about 11 000 kgs of silver per year With the contemplated expansion programme silver recovery will also go up

Tungsten The import of tungsten ore, metal and products during last six years are given below

Year	*Ferro tungsten*		*Tungsten ore and concentrates*		*Tungsten in ots*		*Tungsten products value*	*Total value*
	Qty (Tonnes)	*Value* (Rs lakhs)	*Qty* (Tonnes)	*Value* (Rs lakhs)	*Qty* (Tonnes)	*Value* (Rs lakhs)	(Rs lakhs)	(Rs lakhs)
1961 6[illegible]	63	8	—	—	3	2	19	29
1962 63	61	5	—	—	1	1	39	45
1963 64	16	1	—	8	4	3	34	46
1964 65	181	13	—	3	1	1	[illegible]4	41
1965-66	45	7	100	9	17	9	[illegible]1	46
1966 67	35	9	154	33	4	4	23	69

There is no production of tungsten in India and as such the import figures may be taken as the minimum demand in these years With the programmes for increasing the manufacture of alloy steels the requirement of tungsten will go up

Rajasthan possesses the only known tungsten ore deposits in the country Mining of the ore was undertaken during war years and again between 1950 and 1954 A detailed prospecting programme had been undertaken by the Indian Bureau of Mines during last several years and it is expected that the same would shortly be completed

As soon as the ore is proved, steps should immediately be taken in the Fourth Plan period itself to extract metal from the ore This will save the much required foreign exchange The size of the plant can only be decided after completion of the prospecting by Indian Bureau of Mines

Secondary Products of Steel and Other Metals

Mild Steel Re rolling

There are three re-rolling mills in Rajasthan licensed under the Industries (Development and Regulation) Act, 1951 with a total capacity of 5 400 tonnes per year In addition there are a few smaller units in this field Generally the re rolling industry caters to markets close by and produces mainly bars angles squares and flats used in construction works as re inforcement etc The requirement of bars and rods for construction purposes in the State in 1973 74 is estimated 15 000 tonnes This demand can be met to a great extent by multiple shift working of the present units No new unit is suggested

Steel Structural Fabrication

The use of fabricated structures is very wide—from industrial buildings to power stations to transport to sluice gates to steel bridges etc By 1973 74 the demand for fabricated steel structures is expected to be of the order of 640 000 tonnes The present installed capacity is 375 000 and the total installed and sanctioned capacity is of the order of 1 04 million tonnes

In Rajasthan Kamani Engineering Corporation Jaipur is having manufacturing capacity of (a) 24 000 tonnes of transmission towers and (b) 6 000 tonnes of heavy structurals The capacity of this unit is sufficient to meet the local demand and at the national level no additional capacity need be set up hence neither an expansion of the existing unit or the setting up of a new unit is suggested in Rajasthan

Iron Castings

The present installed capacity in the country for the production of iron castings amounts to 1 478 million tonnes including small scale sector An additional capacity of about 0 217 million tonnes has also been licensed making a total of 1 695 million tonnes The demand by 1973 74 is expected to be of the order of 2 10 million tonnes Some of the gap between demand and likely supply will be taken care of by public sector projects like foundry forge plant pumps and compressors plant Therefore there may not be scope for new large foundries some expansions in presently sanctioned capacities may be possible

No large iron foundry exists in Rajasthan at present There are few foundries operating in the small scale sector but these are not well organised to be economical Two large units have however been recently licensed in the State, M/s Associated Iron & Steel Industries with a capacity of 9 000 tonnes per year and M/s Kamani Engineering Corporation with a capacity of 4 800 tonnes for heavy duty castings The second unit is associated with the setting up of a pig iron plant As the pig iron unit may not come up in the near future the fate of the foundry unit is also uncertain

STEEL CASTINGS

In Rajasthan M/s National Engineering Co, Jaipur are putting up a steel foundry This will be casting axle boxes, etc, required by the firm which were previously procured from outside foundries

The overall position in the country is such that the demand has not caught up as per expectations and consequently there is an over licensing of capacities The capacities licensed till now are of the order of 420 270 tonnes while the anticipated demand in 1973 74 will be below 200,000 tonnes Under these circumstances no new steel foundry capacity is suggested in Rajasthan

C I SPUN PIPES

Cast iron pipes find extensive use in water supply works These are also used for culverts and rain water disposal The requirement of C I pipes in the State has been estimated on the basis of urban and rural water supply schemes during the Fourth Plan period The requirement will be of the order of 24,000 tonnes by 1973 74

In Rajasthan two units were licensed in 1960 for the production of C I spun pipes--Paramount Industries & Agencies Jaipur, with a capacity of 24 000 tonnes and Rajasthan Pipes Ltd Kota with a capacity of 30 000 tonnes per year Both these projects did not make any progress and recently the two licences were revoked In view of the excess capacity in the country for C I pipes no unit is recommended in Rajasthan

STEEL PIPES AND TUBES

The demand by 1973 74 for steel pipes and tubes will be of the order of 490,000 tonnes The present installed capacity is of the order of 483 680 tonnes and an additional capacity of 86 600 tonnes is under implementation and licences are pending for 264 000 tonnes giving a total of 834 280 tonnes per year if all the licences materialise From the above it is clear that there is not much scope in this field at present

Steel Wires

The production of wire drawing unit (controlled by steel control) in the country during 1966-67 and 1967 68 was as follows

(In tonnes)

Type of wire	*1966 67*	*1967 68*
Black wire	49 260	48 016
Galvanised iron wire		
(a) Telegraph wire	2 805	830
(b) Others	38 719	30 080
High carbon wire	15 529	26 640
Total	*106 313*	*105 566*

The import of steel wires during last six years is given below

Year	*Import* (In tonnes)
1961 62	104 346
1962 63	78 773
1963 64	78 381
1964 65	78 2 3
1965 66	36 631
1966 67	16 087

These heavy imports are indications of the gaps between the country s demand and indigenous production The demand of steel wires in 1973 74 has been estimated by NCAFR at 420 000 tonnes

The capacities existing and licensed/approved both in large and small sectors and capacities sanctioned under the Iron & Steel Control Order account for a total of about 350 000 tonnes Even if all the licensed and approved schemes materialise there is still scope for additional capacity

In Rajasthan there is no unit in this field It has not been possible to estimate the firm demand for steel wires in the State but it can easily be said that local demand will easily sustain one unit of medium size It is suggested that a unit with a capacity of 5 000 tonnes per year be set up in the State One unit has already been recommended by the State Government for grant of an industrial licence

Special Light Sections

In Rajasthan there is one unit Man Industrial Corporation Ltd Jaipur for rolling of special light sections such as window sections etc Estimates of demand for these special sections are not available but it is expected that the use of steel windows and doors will rise rapidly due to general shortage of

timber It is suggested the existing capacity in this field be expanded but after a detailed demand survey has been undertaken

COPPER AND BRASS PIPES TUBES, SHEETS AND CIRCLES

The installed capacity and production of these items in recent years have been as shown below[1]

(In tonnes)

Year	Pipes and tubes		Sheets and circles	
	Installed capacity	Production	Installed capacity	Production
1961	4 0[illegible]0	455	54 000	28 980
196[illegible]	4 020	485	54 000	27 276
1963	4 9[illegible]0	952	48 000	25 812
1964	4 920	1 261	48 000	22 39[illegible]
196[illegible]	4 [illegible]20	1 5[illegible]	48 000	14 940
1966	4 920	1 1[illegible]	48 000	5 976

The import of these items in the country in past few years is given below

(In tonnes)

Year	Pipes and tubes	Sheets and circles
1961 62	1 85[illegible]	845
19[illegible]2 63	1 312	1 [illegible]8
19[illegible]3 64	2 031	784
19[illegible]4 6[illegible]	1 6[illegible]4	1 434
196[illegible] 66	1 504	1 73[illegible]
1966-67	754	997

The capacity targets for non ferrous pipes and tubes and sheets and circles have not been clearly defined but in view of the increasing industrial uses of these semis it is to be expected that there would be considerable scope in future to increase the capacity specially for pipes and tubes

In Rajasthan in the organised sector there are two units in production A Mukherjee & Co Jaipur and Multimetals Ltd Kota In view of the increasing industrial use and also in view of the availability of raw materials in State for this industry as a result of commissioning of Khetri copper smelter and Debari zinc smelter Rajasthan offers good scope for new units in the field It is suggested that a unit be established in State with a capacity of 1 000 tonnes of tubes per year

ZINC SHEETS AND STRIPS

The installed capacity and production of zinc sheets and strips during last few years is shown in the following table[1]

[1] Central Statistical Organisation *Monthly Statistics of Production*

		(In tonnes)
Year	*Installed capacity*	*Production*
1961	5 376	3 774
1962	5 376	3 526
1963	5 376	3 882
1964	4 800	4 648
1965	4 800	4 404
1966	4 800	4 069

Import of zinc sheets and strips during the above period was

Year	*Imports* (Tonnes)
1961 62	185
196 63	281
1963 64	227
1964 65	139
1965 66	234
1966-67	545

A capacity target of 10 000 tonnes has been suggested for 1973 74 for this industry by the Planning Commission Considering the large gap between presently installed capacity and the targeted capacity for 1973 74 there is good scope for developing this industry

With the commissioning of the zinc smelter of Hindustan Zinc Private Ltd at Debari Udaipur raw material for this industry, that is zinc ingots will be available within the State It is suggested that a unit, with a capacity of 5 000 tonnes be set up in the State for the production of zinc sheets strips and other semi manufactures

Lead Sheets Pipes and Tubes

The installed capacity and production of these items in recent years have been as shown below

(a) Lead Pipes and Tubes

		(In tonnes)
Year	*Installed capacity*	*Production*
1961	4 872	[illegible]34
1962	4 872	752
1963	4 872	[illegible]04
1964	4 872	60[illegible]
196[illegible]	4 872	4[illegible]3
196[illegible]	4 872	246

(b) **Lead Sheets** (In tonnes)

Year	*Installed capacity*	*Production*
1961	2 316	504
1962	2 316	720
1963	3 000	756
1964	3 000	660
1965	3 000	372
1966	3 000	672

Capacity targets have not been fixed for these items for the Fourth Plan Estimates of demand for these in 1973 74 are also not available In Rajasthan Hindustan Zinc Private Ltd (Metal Corporation of India) have a licence for producing 3 400 tonnes of lead sheets and 3 400 tonnes of lead pipes per year There is already a large underutilisation of existing capacities in this field as is evident from above tables It is suggested that the Rajasthan unit be established only when a new lead smelter is put up in the State after the proving of Katar deposits for lead ore

Metal Products Except Machinery and Transport Equipment

This group comprises industries which turn out products of metal and which are used either as such or are used as components in manufacture of other items Table 11 gives a list of the metal products normally demanded The majority of the items can be classified as consumer products and except for a few they can also be manufactured in the small scale sector The overall growth envisaged for this sector during the Fourth Plan period is such that the output in 1973 74 would be about double the output in 1960 61 The discussion here for this group of industries is restricted only to those items in which large unsatisfied demands exist Due consideration has been given to the possible requirements of these products within the State

INDUSTRIAL FASTENERS

The term industrial fasteners embraces black bolts, nuts rivets dogspikes high tensile bolts and nuts machine screws wood screws and wire nails The capacity targets for 1973 74 and the present licensed capacities for these items are given below

Items	*Unit of production*	*Capacity target (1973 74)*	*Present licensed capacity*	*Apparent gap*
Black bolts, nuts and rivets	000 tonnes	125	60	65
Wood screws	000	14	12 9	1 1
Machine screws	000 ,	8	6 1	1 9
Wire nails	000	31	35 8	(—) 4 8

The large gaps between the capacity targets and presently sanctioned capacities clearly indicate good development possibilities in this field

In Rajasthan, one firm M/s Kamani Engineering Corporation Jaipur, has been licensed to manufacture 8 000 tonnes of high tensile bolts and nuts There is no other unit in organised sector in this field In view of good scope as well as the requirement in the State, it is suggested that a bolt and nut factory with an annual capacity of 10 000 tonnes be set up in the State

AGRICULTURAL IMPLEMENTS

The tentative target for 1973 74 and the presently sanctioned capacity in the country for agricultural implements are as shown below

	Tonnes
Tentative target for 1973 74	66 000
Presently installed capacity	31 500
Apparent gap	34 500

Apart from the sanctioned capacities in the organised sector, there are a large number of small scale units engaged in the production of agricultural implements Nevertheless there is scope for additional capacity in the organised sector specially in view of the call for increased agricultural production during the current Plan period There is no unit in the organised sector in this field in Rajasthan though some units in small scale sector are reported to be manufacturing a few types of implements On completion of the large irrigation schemes like Rajasthan Canal the demand for agricultural implements within the State can be expected to increase It is suggested that a medium sized unit be established in the State to manufacture 2 500 tonnes of agricultural implements per year

Machinery Except Electrical

The group covers a large number of items which can be classified in the following six sub-groups

(a) Agricultural machinery
(b) Mining earthmoving and construction machinery
(c) Prime movers boilers etc
(d) Industrial machinery
(e) General items of machinery
(f) Commercial household and office machines

Table 12 gives the targeted capacities for 1973 74 the capacities sanctioned upto end of 1967 and the apparent gaps between targeted capacities and sanctioned capacities for the various industries in this group

In Rajasthan this group of industries is virtually absent, except for the existence of two units—M/s National Engineering Industries Jaipur, and M/s J N Marshal & Co Kota M/s National Engineering Industries is engaged in the manufacture of ball bearings and M/s J N Marshal & Co, are manufacturing tar boilers tractor trailers stone crushers etc

The discussion in this section for the development of machinery industries in Rajasthan is confined only to those items where at the national level, there are substantial gaps between targeted and sanctioned capacities These are

(*a*) Machine tools
(*b*) Machine tool accessories
(*c*) Agricultural tractors and tractor drawn implements
(*d*) Diesel engines stationary

COMPLETE MACHINE TOOLS

By 1973 74 the demand in the country for complete machine tools has been estimated at Rs 108 crores The present sanctioned capacity in this field is Rs 75 crores worth machine tools

In Rajasthan Hindustan Machine Tools Ltd, are putting up with Yugoslavian help a factory at Ajmer for manufacture of 3 000 tonnes of machine tools, mainly grinding machines The value of output will be about Rs 5 crores No other factory is suggested for complete machine tools

MACHINE TOOL ACCESSORIES

The production of machine tool accessories in the country is very low Against the estimated production of Rs 3 20 crores in 1973-74 the present capacity and production is only of the order of Rs 1 30 crores The relationship between production of complete machine tools and machine tool accessories in industrialised countries like the U S A is of the order of 10 1 This relationship is at present 46 1 for India Obviously there is good scope for setting up further capacities for these items In Rajasthan there is no unit engaged in the field of machine tool accessories at present It is suggested that a unit be set up in the State with a capacity of accessories valued at Rs 1 crore

AGRICULTURAL TRACTORS AND TRACTOR DRAWN IMPLEMENTS

It will be noticed that there is a large gap to be closed for meeting the estimated demand of 48 000 numbers for agricultural tractors in 1973 74 There is no unit in Rajasthan for manufacture of these items With the completion of Rajasthan canal and other irrigation works a large area of

virgin land will be brought under cultivation and the local need for partial mechanisation of farming will be there Therefore, the State offers a good region for setting up a unit to manufacture agricultural tractors The suggested capacity is 5 000 per annum

The gap in case of these implements is even larger than in the case of agricultural tractors The production of these implements may also be contemplated in the unit suggested to manufacture tractors The capacity may be 5 000 numbers per year

DIESEL ENGINES, STATIONARY

This is another field with a very large gap The demand for diesel engines, stationary is expected to be of the order of 256 000 by 1973 74 while the presently installed capacity is only 69 000 engines on single shift basis and production in 1967 was 120 000 engines This industry is a delicensed industry now One unit with a capacity of 10,000 diesel engines is suggested in Rajasthan

Electrical Industries

This group comprises of items such as transformers motors generators switchgears controlgears, electric fans dry cells radio receivers electrical appliances conductors cables winding wires etc Table 13 lists the various items of this group their capacity targets for 1973 74 the presently sanctioned capacities and the apparent gaps to be bridged to meet the demand by the end of Fourth Plan period

Except for house service meters and cable manufacture, there has not been much development of industries of this group in Rajasthan Licences have been issued for the manufacture of electrical lamps and capacitors, while the unit for electric lamps is expected to go in production soon there is no progress reported by the unit for capacitors

The discussion on the future prospects in Rajasthan for industries of this group has been limited to only those where some progress has already been recorded in the State and those where there are large gaps between licensed and targeted capacities for 1973 74 as shown in Table 13 Rajasthan can establish units for these industries partly to meet the State demand and partly to meet the demand in adjoining areas on the national level

ELECTRICAL LAMPS

The production of G L S lamps and fluorescent tubes in the country during the last five years is shown in the following table

(In million nos)

Year	G L S lamps	Fluorescent tubes
1960	35 611	1 526
1961	40 6 0	1 895
1962	50 051	3 175
1963	58 566	3 638
1964	58 418	3 439
1965	60 ,63	4 178
1966	68 ,66	4 060

The imports of these during above years have been very little

The tentative targets of capacities by 1973 74 are 214 million numbers and 13 million numbers for G L S and similar lamps and fluorescent tubes respectively The present installed and licensed capacities in the industry are as follows

	Million numbers
G L S and similar lamps	173 2
Fluorescent tubes	12 5

In Rajasthan, M/S Electro-Technical Enterprises Jaipur, have been licensed and is putting up a factory for manufacture of 6 million numbers G L S lamps and one million numbers fluorescent tubes per year The unit is expected to go in production soon It is suggested that this unit be allowed to expand the capacity by 50 per cent during the Fourth Plan period

House Service Meters

The installed capacity and production figures for house service meters for last few years are as shown below

(In numbers)

Year	Installed capacity	Production
1960	384 000	480 432
1961	444 000	631 956
1962	564 000	877 740
1963	1 0 0 000	1 193 6 8
1964	1 160 000	1 215 732
1965	1 160 000	1 101 500
1966	1 265 000	1 045 824

The target of capacity in 1973 74 for this industry has been put at 2 28 million numbers The present licensed capacity is 1 853 million numbers

In Rajasthan there is one unit M/s Jaipur Metals and Electricals having a capacity of 200 000 meters per year In view of the gap in target and sanctioned capacity this unit could plan to expand its production during the Fourth Plan

Winding Wires

The production of winding wires in the country for last few years is as shown below

Year	Tonnes
1960	4 212
1961	5 664
1962	6 804
1963	7 932
1964	8 940
1965	9 588
1966	9 636

The import of winding wires in the country has been as given below

Year	Tonnes
1961 62	905
1962 63	886
1963 64	1 001
1964 65	1 185
1965 66	19
1966 67	187

The capacity target for 1973 74 has been put at 26 000 tonnes and the present licensed capacity is of the order of 26 000 tonnes while installed capacity is only 12 500 tonnes All the licensed capacity may not materialise and with the commissioning of the Khetri copper smelter the basic raw material for this industry—namely electrolytic copper—will be available in the State Therefore it is suggested that a unit with a capacity of 5,000 tonnes be established in the State

Cables

Paper Insulated Cables The production of paper insulated cables in the country during the last seven years has been as shown below

Year	Kilometres
1960	917
1961	1 211
1962	2 [illegible]60
1963	461
1964	2 639
1965	4 518
1966	4 511

The import during last few years has been as shown below

Year	Kilometres
1961 62	1 296
1962 63	1 403
1963 64	[illegible] 421
1964 65	1 173
1965 66	1 912
1966-67	1 130

The capacity target for 1973 74 for this industry has been placed at 22,600 kilometres The present licensed capacity is of the order of 26,000 kilometres but all the licences may not materialise In Rajasthan, there is one firm M/s Oriental Power Cables Ltd, Kota, manufacturing paper insulated cables with a capacity of 960 kilometres per year The present capacity may be doubled to reach about 2,000 kilometres per year by 1973 74

Plastic and Rubber Insulated Cables and Flexibles The production of these items during the last six years has been as given below

Year	*Million metres*
1961	210 J
1962	276 4
1963	314 4
1964	337 8
1965	396 0
1966	379 0

The import during the same period has been

Year	*Million metres*
1961 6	1 723
196 63	3 704
1963 64	3 057
1964 65	1 652
1965 66	0 878
1966 67	0 775

The target for 1973 74 for these cables ha been put at 520 million metres The present licensed capacity is 1 052 million metres In Rajasthan, M/s Rajasthan Cable Industries Pvt Ltd are licensed to manufacture 10 million metres of V I R cables No additional capacity is suggested

ELECTRICAL APPLIANCES

There is no unit in Rajasthan manufacturing electrical appliances such as refrigerators air conditioners, electrical ranges etc There is a possibility of establishing a unit in this field An investment of Rs 0 50 crore has been provided for this and any other po sible items not discussed above

Transport Equipment

Except for wagon manufacture and a few repair shops for automobiles and a few automobiles parts units in small scale sector there has been no development of this industry group in Rajasthan The future development prospects in this group of industries are limited Production of motor cycles and scooters and development of automobile parts industry on a larger scale are possible

Bicycles

One unit M/s Hitkari Bros was licensed for manufacture of 30 000 bicycles in the State but as no progress was made the licence was later revoked The present position in the country in regard to the bicycle industry is such that it does not offer scope for licensing of new units In view of above, no new unit is suggested in the State

Scooters and Motor Cycles

The production of motor cycles and scooters during the last few years is as shown below

(In numbers)

Year	*Motor cycles*	*Scooters and scooterattes*
1960	3 [illegible] 6	13 0 0
1961	4 66	1[illegible] 366
1962	8 014	14 568
1963	9 456	15 412
1964	13 86[illegible]	20 080
1965	21 360	20 244
1966	4 6 4	20 652

The present production is far from adequate and there is a large unsatisfied demand The demand is further expected to rise in the future There is no unit in the State for the manufacture of motor cycles and scooters The claim of Rajasthan for at least one unit is quite justified

Automobile Parts

There are a number of small units in the State manufacturing automobile parts such as radiators pressure flex pipes king pin and piston pin sets etc Considering the planned growth of automobile industry and the decision to rapidly increase in indigenous components there is good scope in this field It is suggested that a few of the efficient units in small scale sector be allowed to expand so as to become medium and/or large size establishments

Railway Wagons

The target for railway wagons in terms of four wheelers has been placed at 26 000 for 1973 74 The presently installed capacity for manufacture of wagons in the country is of the order of 29 900 wagons a year This capacity can easily meet the expected demand by 1973 74 even taking into account the export demand More production can be achieved if necessary by working

multiple shifts In Rajasthan, Central India Machinery Manufacturing Co Ltd, Bharatpur, was licensed to manufacture 1,000 wagons a year In 1964, its capacity was increased to 1 875 wagons a year In view of above no additional capacity is suggested in this field

Miscellaneous Industries

This group of industries covers several items such as precision instruments process and control instruments surgical and x ray instruments, cameras musical instruments etc

The requirement of scientific instruments in 1973 74 will be of the order of Rs 32 40 crores This is a field with wide development possibilities The main difficulty in the field of instruments manufacture is obtaining the know-how and specialised components The Union Government has established one unit for manufacture of instruments in Rajasthan The other proposed unit in public sector at Palghat (Kerala) has been given up

The Rajasthan unit M/s Instrumentation Ltd, Kota is to manufacture 1 14 300 pieces of magnats—electric instruments 20 220 pieces of electronics automatic recording and control instruments and 398 400 transmitting elements The sale value of the annual output will be of the order of Rs 11 5 crores The capacity in this unit is greatly unutilised and it will be worth while to examine the possibility of diversifying the present range of production In addition to this public sector unit there is one private sector unit in Rajasthan M/s Toshniwal Industries Ltd This unit is licensed to manufacture (*a*) electrical instruments—4 600 numbers (*b*) industrial process instruments—1 950 numbers (*c*) laboratory apparatus of B T L design—Rs 7 2 lakhs (*d*) PW meters—Rs 4 1 lakhs and (*e*) tubular rheostats—Rs 1 lakh This unit has plans to manufacture x ray testing equipment also The Central Electronics Research Institute Pilani Rajasthan is doing pioneering work in developing indigenous know how in the field of electronic instruments It has already developed T V sets and T V aerials etc

In view of the above schemes in Rajasthan no further capacity is suggested for instrument manufacture

Summing Up

The development possibilities in individual industries hitherto discussed in this chapter for various industries group have been given in Table 14 A consolidated statement is given below The broad economic implications of the suggested developments are given in the following table

Additional investment by 1973 74 (Rs crores)	68 89
Net output (Rs crores)	15 97
Additional employment by 1973 74 (Numbers)	15 [illegible]00
Additional power requirement by 1973 74 (kW)	31 750
Additional transport requirement by 1973 74 (Tonnes)	311 000

5 Mineral Based Industries—Non-Metallurgical

AMONG THE IMPORTANT non metallic minerals in Rajasthan are limestone gypsum mica glass sand feldspar steatite and clays Industrial possibilities for the Fourth Plan ba ed on the above minerals have been dis cussed in this chapter Consideration has also been given to the recovery of fluorine in the phosphatic fertilizer plants proposed as adjuncts to the copper and zinc smelters and the production of synthetic cryolite and alumi nium fluorides therefrom

Among the new suggestions for the Fourth Plan are the following

Industries based on limestone gypsum and feldspar	(i) Portland cement (ii) Portland cement cum-sulphuric acid (iii) White cement cum sulphate of potash
Industries based on mica	(iv) Micanite or built up mica (v) Wet ground micas
Industries based on glass sand	(vi) Arch tectural glass building blocks
Industries based on by product recovery of fluorine	(vii) Synthetic cryol te and aluminium fluoride

PORTLAND CEMENT

Rajasthan has large limestone tracts in Jaipur, Kota Udaipur and Jodhpur divisions Besides limestone, the gypsum deposits in Bikaner and Nagaur

could also be utilised to make cement along with sulphuric acid manufacture

At present there are three cement factories in production in the State, at Lakheri, Chittorgarh and Sawai Madhopur Together, the total annual capacity of the three units is 1,352,130 tonnes

Before considering the possibilities for additional cement capacities in Rajasthan it would be appropriate to consider consumption in the neighbouring areas For this purpose Rajasthan, Punjab Uttar Pradesh and Delhi have been considered together

Actual Statewise consumption data are not available However, past trends in the despatch of cement to this composite area may be taken as a measure of the consumption

Despatch of Cement[a]

	1958	*1959*	*1960*	*1961*
India				
Quantity (Tonnes)	6 037 093	6,703 937	7 650 499	8 120 582
As per cent	100 0	100 0	100 0	100 0
Rajasthan Punjab Uttar Pradesh and Delhi				
Quantity (Tonnes)	1 487 146	1 766 408	1 831 687	2 154 201
As per cent of all India	24 9	24 9	24 0	26 5

[a] Podder V 1962 *Cement Industry in India* p 57

Assuming that the requirements of this composite area continues to be in the same proportion to the total all India (about 25%), 5 5 million tonnes of the total 22 million tonnes estimated for 1973 74 for the country as a whole would be the requirement in these four States by that year Rajasthan because of its large deposits of limestone can easily meet over 50 per cent of this requirement that is 2 75 to 3 00 million tonnes The installed capacity being 1 35 million tonnes additional capacity that can be planned will be of the order of 1 4 to 1 65 million tonnes

Five schemes for production of cement are in various stages of implementation These are at Bundi Beawar Udaipur Nimbhahera and Neem ka Thana Steps should be taken to put them in production at an early date and establishment of additional capacity to bring the total capacity to about 3 million tonnes

One unit for production of 105 000 tonnes of cement based on gypsum in Bikaner area could also come up

The possibility of producing cement clinker as an adjunct to a 100 000 tonnes per year sulphuric acid plant has been discussed in the Chapter on Mineral Development and Mining Industry where it has been shown that sulphuric acid could be produced from such a source competitively

White and Coloured Cements

At present white cement production is confined to three units, one at Porbander in Gujarat another at Kymore in Madhya Pradesh and, the third, at Kottayam in Kerala Together, the three units have an annual capacity of 118,860 tonnes The licence for a fourth plant in Madras for an annual capacity of 16,760 tonnes has since been revoked

On the basis of licensing it would appear that white cement capacity was thought of upto a level of one per cent of the total cement capacity It was 93,460 tonnes out of 9 474 140 in 1962 or 0 98 per cent and, 135,620 tonnes of the 16 211 890 tonnes of anticipated productive capacity at the end of the Third Plan or 0 83 per cent If such a relationship were to be extended to the Fourth Plan a white cement capacity of 155,000—175,000 tonnes can be considered by 1970 71 on a basis of 0 7 to 0 8 per cent of the total cement capacity of around 22 million tonnes in 1973 74 Thus there appears to be room for further units to the extent of about 50 000 tonnes a year More over, a plant in Rajasthan would also be favourably situated to supply the growing market in the north that is Rajasthan, Delhi and Punjab, the existing plants are similarly situated to cater to the markets in the east south and west

The manufacture of white cement is similar to that of portland cement but require high purity materials and great care to avoid contamination in the processing in order to obtain a white colour Coloured cement is made by mixing different pigments to white cement

Because of the relative scarcity of pure clays, attempts have been made to make white cement from feldspar, limestone and gypsum with potassium sulphate as a by product

Feldspar limestone and gypsum from Rajasthan have been tested and used in a pilot plant to produce white cement and sulphate of potash [1] Feldspars can be had from Ajmer and gypsum from Bikaner and Nagaur, limestone is available at a number of places as detailed in the section (page 64) on port land cement In view of the existing rail alignments, a location of Neem ka Thana is suggested To begin with a 50 tonnes per day unit is recommended giving an annual production of 16 500 tonnes of white cement and 1 070 tonnes of sulphate of potash and is likely to require an investment of Rs 55 to 60 lakhs

Industries Based on Mica

Rajasthan is one of the three important mica producing areas in India

[1] CSIR *Research and Industry* 1962 Vol 7 No 1 pp 4 7

Annual mine output of crude mica is around 7 000 tonnes On dressing 65 to 70 per cent of this goes into the waste dump

Among the various mica manufactures are punched discs built up mica, ground mica and mica insulating bricks So far very little has been done in the above directions There are a few dry mica grinding plants, two of which are in Rajasthan one mica insulating brick factory in Rajasthan and one built up mica or micanite factory, in Bihar

The first of these is a highly specialized industry where the mica is required to be stamped to the exact dimensions and designs required for tube spacers, capacitor films etc, as required by individual consumers It is possible that the necessary dies be obtained on a technical collaboration basis from *consumers in the U S or Japan without which the production of* punched discs cannot be undertaken dependent as it is on an export market As stated earlier there is one mica brick factory in the State Two more units are under consideration elsewhere in India That being so further units may not have much prospects

However it is felt that one unit to produce 300 tonnes a year of built up mica heat resisting commutator moulding and flexible micanite mica folium tubes etc and another to produce 1,500 tonnes of wet ground mica may have possibilities in Rajasthan

At present all the mica grinding units in India produce dry ground mica Wet ground mica superior retaining its sheen with smooth round edged flakes in contrast to the abraded faces and torn and backed edges of dry ground mica Wet ground mica is primarily used by the paint wall paper and tyre manufacturers

Efforts are bring made to promote the use of mica in paints indigenously mica base aluminium and exterior paints are understood to have been reported to be satisfactory by the Defence Science Laboratory Kanpur

While wall papers are not in use in India the third use i e as a filler in tyres would seem to offer some scope China clay is used for this purpose now Since good quality china clay is of rather limited occurrence in India use of wet ground mica can be of great advantage in the long run Requirements of fillers in the rubber industry is estimated at 250 000 tonnes by *1973 74 Once production of wet ground mica* has been started it may not be difficult to persuade tyre manufacturers to use wet ground mica instead of china clay

These two units one for a 300 tonnes per year[1] built up mica and the other for 1 500 tonnes of wet ground mica may together require an investment of Rs 40 lakhs

[1] On three shifts per day

GLASS

Rajasthan has adequate resources of glass sand, at one time there were as many as six glass plants in the State only the one at Dholpur survived but this unit is also lying closed now This unit made vials and laboratory ware More recently, another unit has been proposed at Dholpur, which will make 1 200 tonnes of glass tubing as also thermometers syringes, test tubes and table and blown ware [1]

The demand for glass had increased at a brisk rate, at an annual average rate of 17 per cent during the Second Plan On this basis the Third Plan had envisaged that despite competition from metal and plastic containers and increasing reuse the demand may yet increase at an average annual rate of at least 15 per cent However the demand trends for the various glass ware during the Third Plan has belied the above expectation Demand estimates made in connection with the Third Plan capacity targets suggested for 1965 66 and capacity installed and production are compared in Table 15

It can be seen that in most cases the capacity installed came up to the target levels suggested in the Third Plan but capacity utilisation was about 50 per cent only In the two cases where the capacity utilisation is better, i e bottles and vials and glass shells installed capacities are well below the targets uggested It would therefore appear that by 1973 74 there will only be a marginal scope for additional capacities in conventional glass industries

Therefore for further opportunities in glass one has to turn to new items Today the Indian glass industry produces a wide variety of products viz, sheet and plate glass including laminated afety wired and figured glass various domestic wares laboratory and clinical wares lamp ware hells for lamps and inners for vacuum flasks new items like fibre crystal signal and ophthalmic glasses have been introduced during the last few years

Architectural glass building blocks may offer some prospects in Rajasthan particularly directed towards a market in Delhi where there is consider able activity in sophisticated modern styles of building and which may be expected to continue in the future To begin with a small production of about 300 500 tonnes per year is suggested and may entail an investment of about Rs 8 lakhs

Among others fibre glass may have some possibility Glass fibres have been finding increasing use both as a reinforcing element in the form of filament texture fibres and, in insulat on fabrics in the form of staple fibres With regard to the former, it is understood that the demand for

[1] The Plan frame compiled by the Planning Department Government of Rajasthan indicates an investment of Rs 1 crore on this in the Fourth Plan

glass reinforced plastics has been placed at about 10 000 tonnes per year by 1973-74 This would require about 3,000 to 4 000 tonnes of glass fibre, one firm has already been licensed to set up a capacity of 3 150 tonnes per year

While further possibilities are not considered in these two areas for the present, there are two developing applications for glass fibres i e, in tyres and glass cements [1] It is reported that the Esso Research and Engineering Company and Owens Corning Fibre Glass Corporation have jointly reported the development of tyres made with glass fibre, for which reinforcement properties superior to cotton and rayon cords have been claimed The other is the development of glass cement building materials in the U S S R Both these applications should be considered as in the development stage and beyond indicating future possibilities no firm recommendation can be made at present

CERAMICS

The commonly used ceramic wares are, white ware—table and sanitary ware electrical insulators and porcelain stone ware pipes and fittings and refractories

White ware The white ware industry has tended to develop close to centres of large urban population Thus table ware production is well developed in West Bengal Delhi Gujarat and Maharashtra Much the same can be said of sanitary ware production also, West Bengal and Orissa Gujarat and Maharashtra are the important centres of activity Recently another large unit has been commissioned in Punjab close to Delhi Rajasthan hemmed in as it were between Delhi and Gujarat may offer only a small market for white wares and it is doubtful if small units could be viable in close proximity to large producers unless the same can be developed as an adjunct to a large sized ceramic unit like stone ware tiles etc Perhaps the stone ware pipe plant licensed at Bharatpur could take up a small production of white wares at a subsequent stage

Insulators and Electrical Porcelain In 1961 62 three units were licensed in Rajasthan to produce ceramic insulators two of which were also to produce bushings and steatite electrical porcelain The total capacity licensed was 5 700 tonnes of H T and L T insulators and bushings and 1 000 tonnes of electrical porcelain per year According to the latest available information these licences are not likely to materialise However in view of present demand and supply position in the country no additional capacity is called for

Stone ware One unit is in production for 7,200 tonnes of stone ware pipes and fittings, at Bharatpur No additional capacity is suggested for the present

Refractories The present installed capacity for refractories, in India is 1,336 000 tonnes per year But production over the last few years has been well under capacity, about two thirds as shown below

(In tonnes)

Year	*Capacity*	*Production*
1960	790 800	516 716
1961	802 800	626 551
1962	846 000	670 685
1963	884 400	653 500
1964	960 000	687 839
1965	1 080 000	687 841
1966	1 274 000	722 566
1967	1 336 000	750 000

But more pertinent the implementation of the new capacity licensed is being taken up at a very slow pace, due to reduced demands arising out of the shortfalls in the steel and other industries programmes as also due to changes in refractory practice in the steel industry leading to less refractory consumption per tonne of metal produced and the emphasis on L D steel These trends are expected to continue particularly the emphasis on L D steel Hence additional capacities may not be necessary in the Fourth Plan

SYNTHETIC CRYOLITE

While it has been suggested in Chapter 3 that the fluorite deposit at Mando ki Pal be developed to produce metallurgical grade fluorite possibilities of producing synthetic cryolite aluminium fluoride and other fluorine compounds still exist in the State Reference is again made here to the discussion in Chapter 3 on the Khetri Copper Project, wherein the possibility of recovering fluorine or, its compounds as a by product of the triple superphosphate plant proposed there has been discussed Instances of such recovery in plants in Europe and the U S were also given

A triple superphosphate production of 214,500 tonnes a year is likely to require about 800 000 tonnes of phosphate rock a year Assuming a 3 per cent fluorine content and, fluorine volatalisation at 30 per cent and subsequent recovery at 50 per cent of this about 4 000 tonnes of cryolite and aluminium fluoride can be recovered annually This may require an investment of about Rs 75 80 lakhs

Similar possibilities exist for recovering flourine and produce synthetic

cryolite aluminium fluoride from the superphosphate facility attached to the zinc smelter near Udaipur On 18 000 tonnes of zinc metal a year, the superphosphate production is understood to be rated at 12 200 tonnes a year Possibilities of increasing the zinc metal production to 36 000 to 38 000 tonnes a year have been discussed in Chapter 3 If superphosphate production were also to be stepped up correspondingly about 2 000 tonnes of cryolite can be recovered and may entail an investment of about Rs 30 to 35 lakhs

Implications of the Programme Suggested

This programme as suggested above and discussed individually in subsequent sections is likely to involve a fixed investment of Rs 27 23 crores and yield an annual net output of Rs 6 48 crores by 1973 74 as given in Table 16 A summary of the same is given below

Fixed investment (Rs crores)	27 23
Net output (Rs crores)	6 48
Employment (No of persons)	13 750
Additional transport requirement (Tonnes)	514 000
Additional power required (kW)	2 700

6 Industries Based on Agriculture, Livestock and Forest Resources

IN THIS CHAPTER the discussion is with regard to the prospects for the development of such of those industries which utilise agricultural, livestock and forest resources

Industries Based on Agricultural Raw Materials

TEXTILE INDUSTRIES

The area under cotton and the production of cotton in Rajasthan in the last few years have been as follows

Year	*Area under cotton* (000 hectares)	*Production of cotton* (In mill kgs)
1959-60	237	29 6
1960-61	201	29 5
1961-62	234	30 2
1962-63	193	28.1
1963-64	234	33 3
1964-65	261	33 0
1965-66	278	29 7

Keeping the same rate of increases in area and production of cotton as in the past, it is estimated that the production of cotton by 1973 74 would be 38 million kgs If it is assumed that of the total anticipated production, 31 million kgs would be available for the textile industry, about 0 51 million spindles will be needed to absorb this quantity The present spindleage position in the State is as discussed below

The number of spindles working as on 1 1 1968 was 301 000 As explained earlier a minimum 0 51 million active spindles would be required to use the raw cotton that would be available within the State Therefore there is room for establishing another 0 2 million spindles The additional spindles can be established both by expansion and by setting up new spinning mills The average number of spindles per spinning mill in Rajasthan is small being only 15 000 From the point of view of economic production it is advisable to raise this average figure to 20 000 or 25 000 spindles Such of those existing mills which lend themselves for expansion may be allowed to put up additional spindles so as to achieve a total of 0 1 million spindles by expansion The balance of 0 1 million spindles may preferably be set up in 4 new spinning mills

Regarding setting up of looms the position is dependent on yarn availability and is discussed below

0 51 million spindles can easily turn out 27.5 million kgs yarn This can give 2 20 million metres of cloth Taking into account that 30 per cent of yarn will be needed by the handloom sector, the available yarn for the mill sector would be around 1 945 million kgs This can easily feed 3 850 looms In January 1968 looms working in the State totals only 2,600 Thus there is room for creating additional loomage in the State and it is recommended that 1 200 additional looms be set up all in composite mills

SYNTHETIC FIBRES

Synthetic fibre production has already made a headway in Rajasthan The State has been pioneer in the field by setting up a nylon yarn factory at Kota (J K Synthetics) The original capacity of this unit was 0 25 million kgs of yarn per year and this unit is under expansion After expansion the capacity of this unit will be as follows

	Million kgs
Nylon yarn	1 76
Nylon staple fibres	1 80
Nylon tyre cord	1 00
Acrylic fibre	4 00

There is another unit at Kota (Shriram Rayons) manufacturing viscose high tenacity rayon yarn and tyre cord This unit is also expanding its capacity which after expansion will be 5 64 million kgs

Sufficient capacities have also been licensed elsewhere in the country for synthetic fibres These are likely to meet the national demand upto the end of Fourth Plan Hence no additional capacity is suggested in the State

SUGAR

The sugar industry in Rajasthan has been unsteady, partly due to the fluctuation in the area under sugarcane cultivation and partly due to the variation in the yield per hectare The following figures are relevant

Year	*000 hectares*	*Sugarcane production* (000 tonnes)	*Cane crushed in factories* ('000 tonnes)
1959-60	28	610	142
1960-61	41	1 010	197
1961-62	32	810	167
1962-63	33	810	145
1963-64	39	570	80
1964-65	43	650	104
1965-66	57	735	205
1966-67	32	370	103

SOURCE —*Indian Sugar* Vol 18

The average yield of sugarcane per hectare was 14 4 tonnes only for last four years whereas the all India average yield per hectare is 43 tonnes Rajasthan has to improve its yield per hectare by proper irrigation methods and also by using fertilizers For the purpose of the future development of the sugar industry it is assumed here that the sugarcane yield would be improved and to a minimum of 20 tonnes per hectare

It is estimated that the area under sugarcane in Rajasthan would be raised to about 72 000 hectares by 1973 74

From the above, the State may achieve a production of 1 44 million tonnes of sugarcane per annum at the end of Fourth Plan period Only one third of the sugarcane produced may be available for crushing in sugar factories Thus the available sugarcane by 1973 74 crushing in factories would be around 0 48 million tonnes

In Rajasthan the duration of crushing is not steady and varies every year In the last few years it had varied between 60 and 130 days Assuming that at least 90 to 100 days crushing duration will be maintained in the future a total crushing capacity of 4 800 to 5 300 tonnes per day could be planned in the State at the end of Fourth Plan At present two sugar mills are in production in Rajasthan these are located at Bhupalsagar (Distt Chittorgarh) and Sriganganagar One more unit, under cooperative sector is under erection at Keshoraipatan The total capacity of these units is 3 500 tonnes crushing per day Thus there is room for further crushing capacity of 1 250 tonnes of sugarcane per day It is suggested that one more sugar factory with 1 250 tonnes cane crushing capacity per day be established in the State A suitable location would be Bhilwara District

Rice and Flour Milling

The production of rice in the State in the last few years is as follows

Year	Production (000 tonnes)
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	135 (estimated)

All the paddy that is produced does not go for milling in the organized sector For the country as a whole only 3 2 per cent of the paddy produced is processed in large rice mills A substantial portion is milled at present in small scale and cottage units In the future with increase in urbanisation and change in consumers tastes it is possible that the percentage of paddy processed in large rice mills may increase to 5 per cent Even at this rate the production of paddy in Rajasthan does not offer scope for the establishment of large rice mills because at the anticipated output of 135 000 tonnes in 1973 74 the quantity of paddy for large mills may be only 6 750 tonnes This is considered a low figure and does not lend for economical production in large mills

The production of wheat in the State has been as follows in the last few years

Year	000 tonnes
1959 60	1 032
1960 61	1 012
1961 6	1 63
1962 63	1 089
1963-64	866
1964 65	1 103
1965 66	776

There are 5 wheat flour mills and the total milling capacity is 80 000 tonnes per annum

For the country as a whole, wheat milled in the organised sector to the total output of wheat has been around 20 to 25 per cent during recent years Assuming the same ratio for Rajasthan 260 000 tonnes of wheat would be made available for milling in organised sector by 1973 74 that is, additional capacity for milling 180 000 tonnes of wheat will have to be created because the present capacity is only 80 000 tonnes per annum Hence three large flour mills each of 60 000 tonnes per annum capacity are suggested The locations could be flexible

Oil Milling

The all India average for oilseeds crushed in the organised sector is only 10 per cent of the total production Taking the same ratio for Rajasthan, the oilseeds expected to be available by 1973 74 for crushing in organised sector will be 50 000 tonnes per annum as the production of oilseeds in the State is anticipated at 500 000 tonnes

Presently only two cotton seed oil mills have been licensed at Bhilwara and Sriganganagar and these are under construction Thus there is enough room for creating additional capacities for oil milling Seeing the production of oilseeds districtwise, suitable locations for establishment of two large new oil mills each of 10 000 tonnes capacity can be Kota and Alwar

Solvent Extraction of Oil Cake

The residual cake in ghanis and oil mills usually contains 6 to 7 per cent of oil Solvent extraction of the residual oil cake is an important additional source of vegetable oil after which the residual can still be used either as cattle feed or as manure The main difficulty however lies in the fact that collection of oil cake from the oil mills and from ghanis poses a problem If this could be resolved there is ample scope for the establishment of solvent extraction plant At present there is not even a single unit in Rajasthan To commence with it is suggested that in the Fourth Plan at least two units of 5 tonnes per day each capacity of oil be established in the State

Vanaspati

One unit of 10 tonnes per day capacity has recently been commissioned at Bhilwara The unit is located along with the oil milling unit

Because of the change in consumers taste the per capita consumption of Vanaspati is increasing It is assumed that by 1973 74 the per capita consumption of Vanaspati would be 1 2 kilograms for the country as a whole At this rate the demand for Vanaspati in the State of Rajasthan would be around 23 700 tonnes

The estimated demand for this product and the raw materials availability with the State paves the way for setting up additional capacities for Vanaspati However there are the following limiting factors The first is with regard to the commitments already made for supply of oilseeds to oil mills located in neighbouring States such as Gujarat The second difficulty relates to the availability of hydrogen for Vanaspati manufacture The caustic soda unit at Kota can no doubt supply the hydrogen but its transport to

WOOLLEN INDUSTRY

Wool and woollen goods are important earners of foreign exchange among livestock products besides hides and skins

Rajasthan is an important producer of raw wool The State accounts for nearly 45 per cent of country's production

The sheep population in the State according to 1967 Basic Statistics of Rajasthan was 8 806,000 in 1965 66 In Rajasthan the average yield of raw wool per sheep is 0 9 kg as against an average of 0 77 kg for the whole country Shearing is normally done twice a year The production of raw wool recorded in 1962 was 14 5 million kgs but the availability of raw wool in the future can be expected to be larger due to the natural increase in sheep population and also as a result of efforts for producing better yield The availability by 1973 74 may be placed around 20 million kgs

The woollen industry in Rajasthan is not very well organised at present Firstly, only 10 per cent of the production of raw wool is consumed within the State Secondly most of the cleaning and pressing of wool is done in the cottage sector

The present position of the woollen industry in large scale sector is as follows

(a) There is a wool combing plant at Kota with a capacity of 3 4 million kgs of wool tops This unit will require 5 5 million kgs of raw wool for processing into tops This unit is already under production

(b) Woollen mills at Jodhpur have 720 spindles for coarse count woollen yarn Ten power looms for blankets and coarse woollen cloth and 10 handlooms for carpet making This unit has provisions for making regenerated fibre from rags and woollen fibres from shoddy

(c) One unit for woollen yarn has gone in production recently at Bikaner in State Public Sector with 1 250 spindles

It is clear that the above schemes are not adequate to utilise fully the raw wool available in the State Rajasthan has to develop further its woollen industry With this background the following suggestions are made

(a) A wool combing unit be set up for the production of wool tops The capacity of the unit may be 6 million kgs of wool tops This would require 10 million kgs of raw wool A suitable location could be Jodhpur Bikaner

(b) The existing unit for wool top at Kota and the above proposed factory will produce enough short fibres which could be used as

shoddy yarn A spinning capacity for the above could be created with 500 spindles This suggestion had also been put forward in Techno Economic Survey of Rajasthan

(c) A composite mill for spinning and weaving The capacity could be 1 000 spindles and 200 looms This can turn out 2 25 lakh kgs of yarn and 2 million metres of woollen cloth This unit will have to import some quantity of long fibres for mixing A suitable location could be Jaipur

(d) Mills for carpet weaving from rags and shoddy (A similar unit is already at Jodhpur) The same type of unit could be located at Bikaner

(e) The Bikaner spinning mill capacity be expanded by another 1 250 spindles

Forest based Industries

The State is poor in forest wealth

The National Council in its Techno Economic Survey had suggested scientific lines for developing the forests on the assumption that these suggestions for developing the forests would be implemented the following recommendations were also made

(a) Integrated timber industry with Rs 90 lakhs investment

(b) Straw board and paper plant with Rs 30 lakhs investment

The present position with regard to licensing of forest based industries in the State is as follows

Name of industry and location	Capacity	Remarks
(a) Aravali Paper Mills Jaipur	3 000 tonnes pulp and 3 000 tonnes paper	Paper mill has not been established so far
(b) Rajasthan Saw Mills Banswara	7 200 tonnes of chip board	Presently the mill is not working Efforts are being made to restart the mill
(c) M s S G Somanis Kota	6 000 tonnes of chip board	Forest deptt has not yet allotted areas for this mill
(d) Kota Straw Boards Ltd Kota	4 500 tonnes of straw board	No area has yet been allotted to the mill by the Forest Department

No additional capacities are suggested based on forest resources

Summing Up

The development possibilities in individual industries hitherto discussed in this chapter have been given in Table 17 broad implications of which, are given below

Additional investment suggested (Rs crores)	16 9[illegible]
Total net output (Rs crores)	7 62
Total employment (Nos)	2[illegible] 4[illegible]0
Total transport (Tonnes)	[illegible]9 000
Total power (kW)	[illegible]1 800

7

Chemical and Allied Industries

The prospects for the development of chemical and allied industries in Rajasthan during the Fourth Plan will be discussed in this chapter Rajasthan has mineral and other resources for the development of chemical industries but hitherto their exploitation for industrial use has been poor The chief minerals available in Rajasthan for chemical industries are salt limestone gypsum barytes sulphides, etc

The schemes which exist already or are under implementation to utilise these minerals are the following

(a) Rajasthan Vinyl s units for the manufacture of caustic soda and calcium carbide

(b) Zinc smelters where byproduct sulphuric acid will be available for the production of fertilisers

In the light of the national targets for chemical and allied products and in the context of developments already under contemplation elsewhere the further development prospects for the chemical industries in Rajasthan will be examined in the following sections

Fertilisers

Nitrogenous Fertilisers

The area under different principal crops in Rajasthan in 1955 56 and 1961 62 and the anticipated area in 1970 71 is given as follows The recommended dosage of nitrogen for these crops is also given alongside

(000 hectares)

Crop	*1955 56*[a]	*1961 62*[a]	*1965 66*[a]	*1973 74*[b]	*Average dosage*[a] (Kgs per hectare)
Rice	68	101	94	130	45
Wheat	972	1 292	9 6	1 600	45
Jowar	1 159	1 213	1 016	1 260	2?
Maize	540	679	740	850	56
Gram	1 309	1 622	1 130	1 800	11
Groundnut	43	121	217	300	11
Sugarcane	[illegible]	34	57	72	16?
Cotton	2 4	234	270	300	45

[a] *Fertiliser Statistics* 1966 67
[b] Estimated

Based on the above figures the requirement of nitrogen in the State by 1973 74 will be around 0 2 million tonnes per annum Of this wheat jowar maize and gram alone will consume 0 16 million tonnes

At present there is no unit in Rajasthan for the production of nitrogenous fertilisers One scheme is under construction and may be expected to go in production by late 1969 This is the Sriram Chemical and Fertilisers Ltd at Kota having a planned capacity of 130 000 tonnes per year in terms of nitrogen The company is to manufacture 240 000 tonnes of urea 60 000 tonnes of diammonium phosphate and 30 000 tonnes of ammonium chloride by steam reforming of naphtha for synthesis gas

Taking into account the output of this unit there will be a shortfall of 0 07 million tonnes in the supply position to meet a demand of 0 2 million tonnes by 1973 74 in Rajasthan The raw materials required for nitrogenous fertilisers production are (*a*) coal and gypsum (*b*) hydrogen from electrolysis of water and nitrogen from atmosphere or (*c*) naphtha The main problem in Rajasthan for establishing coal baked plants is the long lead for transportation of coal from either Bihar West Bengal or Madhya Pradesh Detailed studies will have to be undertaken to see if a unit based on gypsum available in Rajasthan and coal from the eastern region will be viable As regards alternative (*b*) Rajasthan is not very comfortably placed for electric power The atomic power from Kota station is not expected to be economical from the point of view of electro-chemical industries In case of alternative (*c*) it is reported that there is likely to be an overall shortage of naphtha in the country by 1973 74 However if certain proposals to establish inland refinery in the north western region which is talked about now materialise and if naphtha is available from the same there considerations can be given to a naphtha based fertiliser plant in Rajasthan

PHOSPHATIC FERTILISER

It has been envisaged at the national level that consumption ratio of *nitrogenous fertiliser to phosphatic fertiliser would be 2 1 in terms of their contents* by 1973 74 Thus the demand of P_2O_5 in Rajasthan by 1973 74 would be 0 1 million tonnes to correspond to the estimated demand of 0 2 million tonnes of *nitrogenous fertiliser*

At present only one unit is in production in Rajasthan for manufacture of phosphatic fertilisers *This is* Hindustan Zinc Ltd s Debari unit with a capacity of 12 190 *tonnes of* P_2O_5 In addition to this two other schemes are under implementation, these are

	Tonn P_2O_5
(*a*) Sriram Chemicals & Fertiliser Ltd Kota	[illegible]
(*b*) Khetri Copper Project	[illegible]

On completion of these units the total capacity in Rajasthan will be 139 790 *tonnes*

In Chapter 4 the expansion of Debari zinc smelter is suggested If this is taken additional capacity of 12 000 tonnes of P_2O_5 will be available No further expansion or new unit is suggested for phosphatic fertilisers

Alkalis

CAUSTIC SODA

The demand for caustic soda in the State of Rajasthan by 1973 74 would be around 7 150 tonnes The break up of this will be approximately as follows

	Tonnes
Rayon industry	2 000
Paper industry	500
Organic chemicals	1 500
Soap and vanaspati	[illegible]
Others at 10 per cent of above	650
TOTAL	7 150

The only plant existing at Kota is having a capacity of 50 tonnes per day Because of the expansion scheme envisaged by the Kota unit for P V C production the capacity for caustic soda has also to be increased by another 50 tonnes per day The unit has already received a licence for the same Thus by 1973 74 the total capacity of this unit at Kota would be 33 000 tonnes The production will be rayon grade caustic soda Besides what may be used in their rayon plant the rest of the caustic soda

will have to find a market outside the State No additional capacity is suggested

SODA ASH

The demand for soda ash in the country by 1973 74 is expected to reach 700 000 tonnes At present four units are in production with a total capacity of 363 000 tonnes per year and production in 1967 was about 355,000 tonnes In addition to these four units additional capacities have been licensed making a total of 750,000 tonnes per year but it is highly doubtful if all of this will materialise by 1973 74

Rajasthan has adequate salt and limestone resources which are the main raw materials for manufacture of soda ash by Solway process and can plan to have one unit for manufacture of soda ash with a capacity of 200 tonnes per day

Other Chemical Industries

CALCIUM CARBIDE

The demand in the country by 1973 74 for calcium carbide has been estimated at 72 000 tonnes for the production of acetylene for welding and other chemicals The present total installed capacity in the country is around 66 000 tonnes per annum including one unit in Kota The total licensed capacity in the country is of the order of 84 000 tonnes The Kota unit has a capacity to produce 70 tonnes per day or 23 000 tonnes per annum This capacity is mostly for captive use in the production of P V C Further prospects for the development of the calcium carbide industry either in Rajasthan or elsewhere are ruled out from other considerations, the chief of which is that chemical industries based on acetylene generated from calcium carbide are becoming outdated because of the high cost of production the high cost being attributable to electricity tariffs for this electro-thermal industry Further, the plans in the country for the development of petro-chemical complexes are expected to provide a large variety of feedstock for a number of chemical products The Kota unit will al o be using naphtha based feed stock for P V C manufacture after expansion

ALCOHOL

The existing capacity in the State for alcohol is 20 5 million litres per annum in two units and they have to depend on other States for part supply of molasses as the present sugarcane crushing capacity in the State can

sustain only 8 6 million litres production This position is also not expected to alter appreciably in the future In the section on sugar industry in Chapter 6 it has been noted that the total crushing capacity in the organised sector that can be aimed in the State by 1970 71 will be 4 800 tonnes per day From this a total production of 12 6 million litres per annum of alcohol is possible

In view of the above the prospects for the further development of the alcohol industry in Rajasthan are bleak

Poly Vinyl Chloride

The demand for this plastic is increasing steadily in the country Already there are three plants in operation at Bombay Kota and Mettur The unit at Kota having a capacity of 40 tonnes per day is under expansion and the capacity after expansion would be 20 000 tonnes of resins per year Bombay unit is also expanding to 20 000 tonnes per year capacity and Mettur unit is having 7 000 tonnes per year capacity The other units that are likely to come up in this field are (*a*) Gujarat Petro chemical Complex at Koyali with 20,000 tonnes (*b*) Bombay Complex (NOCIL s) with 20 000 tonnes, (*c*) Madras Petro chemical Complex with 30 000 tonnes and (*d*) Barauni P V C project with 10 000 tonnes If all these schemes fully materialise the capacity will be 127 000 tonnes which is more than the anticipated demand in 1973 74 Hence further increase in the capacity for P V C production in Raja than need not be considered at this stage Further processing industry for plastics does not exi t at present in the State The major P V C proce sing centre are Bombay and Calcutta Thus even the present production of P V C has to move out of the State for further manufacture The State has to do its best in setting up medium and large scale processing centres for P V C as explained in the following section

Proce sing of Plastics

There is scope for a medium processing industry mainly for P V C items to be established at Kota The items that could be aimed at in this unit are as follows

(*a*) Industrial fittings such as pipes tubes valves etc
(*b*) Chemical equipment and acid carboys
(*c*) P V C leather cloth
(*d*) Wires and cables
(*e*) Tiles

Because of the availability of resins compounds and of the increasing demand

for the processed products, there may not be any difficulty in contemplating for Rajasthan a capacity for processing The suggested capacity is to manufacture Rs 0 75 crore worth of goods per annum

Barium Chemicals

The estimated requirement of barium chemicals in the country is around 10 000 tonnes which may increase to 13 000 tonnes by 1973 74

Barytes is found extensively in Andhra Pradesh and Rajasthan Based on the substantial reserves of barytes in Andhra Pradesh the State has already set up a plant at Kothagudam for the manufacture of 6 000 tonnes of barium chemicals per annum in the private sector There is still a gap of 7,000 tonnes in meeting the present and future demand of these chemicals in the country

Rajasthan has reserves of more than 100 000 tonnes This reserve is extensively found in Alwar district There is a factory for the production of the barium chemicals in Rajasthan but it is in small scale sector and the production of the chemicals is negligible as the unit consumes only 1 000 tonnes of barytes per annum for the manufacture of barium carbonate It is suggested here that a large scale unit for the manufacture of barium salts be set up in Rajasthan The capacity can be initially 4 000 tonnes of barium salts out of which 2 000 tonnes could be 'Blane fix Other important barium salts that could be taken up are

	Tonnes
Barium carbonate	800
Barium chloride	200
Barium nitrate	800
Barium sulphide	200

The National Council in its Techno Economic Survey had already suggested a capacity of 3 000 tonnes of Blane fix and 3 000 tonnes of other barium chemicals but so far no capacity has been created in the State for these items A suitable location is along with the mining activities for more barytes of better quality at Udaipur Kota or Alwar

Pigment Industry

Lithophane and zinc oxide are the two important white pigments used in the paint industry The raw materials required for lithophane manufacture are barytes zinc ore coal and sulphuric acid Sulphuric acid could be easily recovered in the manufacture of zinc oxide from zinc sulphide ore Thus the production of zinc oxide and lithophane could be conveniently linked in

one project To start with lithophane manufacture could be easily under taken in the State of Rajasthan Coal has to be secured from Bihar or Madhya Pradesh while the other raw materials barytes zinc ore and sulphuric acid could be made available within the State

In the Techno-Economic Survey of Rajasthan the National Council had suggested a plant for the manufacture of lithophane of 6 000 tonnes per annum The same suggestion is reiterated here and the suitable location could be either Udaipur or Alwar Regarding the manufacture of zinc oxide an initial capacity of 3 000 tonnes could be aimed at along with lithophane manufacture

INDUSTRIAL GASES

Oxygen and acetylene are two important industrial gases used for welding flame-cutting and heating operations

At present there are 2 units in production in Rajasthan for manufacture of oxygen and acetylene These are Sanghi Oxygen Co Jaipur and Shriram Vinyl & Chemicals Kota The capacity of these units is sufficient to meet the regional demand for these gases and no additional capacity is recommended

SYNTHETIC DETERGENTS

Synthetic detergents can conveniently replace soap in many applications It can thus relieve the pressure on vegetable oils for soap manufacture Synthetic detergent is reported to be twice as effective as soap Besides it is an export oriented industry The important raw materials for synthetic detergents are do decylbenzene sodium phosphate and sodium sulphate All the raw materials are available indigenously or will shortly be made available from public sector refineries It is reported that the Central Government is in favour of encouraging the setting up of one unit for manufacture of synthetic detergents in north and north west India Rajasthan can plan to establish this unit The suggested capacity is 4 000 tonnes per year

Summing Up

The development possibilities in individual industries hitherto discussed in this Chapter for various groups have been given in Table 18 broad implications of which are given in the following table

Additional investment suggested (Rs crores)	26 00
Total net output (Rs crores)	6 40
Total employment (Numbers)	7 040
Total transport (Tonnes)	68[illegible] 000
Total power (kW)	[illegible]

8

Perspective of Small Scale Industries Development

Present Status of Small Industries in Rajasthan

SMALL SCALE INDUSTRIES of the modern type are poorly developed in Rajasthan In 1960 61 they contributed only [illegible] per cent of the total industrial income in the State as against 7 4 per cent for all India [1] In all India perspective Rajasthan with 4 6 per cent of the population contributed less than one per cent to the net output arising from such industries However the contribution of traditional non household small industries and of household industries to the industrial income of the State was a little higher (Table 19) The princely States comprising the present Rajasthan State helped in the past mainly to develop a number of handicrafts

In respect of the structure of small scale industries Rajasthan has a larger component of mineral based and textile industries than the case in all India (Tables 20 and 21) In spite of the economy being essentially an agricultural one agro based industries have not been well developed The industries in the mineral group in the State are mostly stone dressing and mica cutting Both these are low value adding processes Excepting cotton spinning and weaving and lately a few metal based industries other important industries here are seasonal Most of them use outmoded machinery and equipments This has led to lower net output per worker, in 1960 61, it was half of that of all India

[1] NCAER *Income and Structure of Manufacturing Industry 1960 61* Occasional Paper No 8 1964

Currently most of the small scale industries in Rajasthan cater to urban demand Ajmer Jaipur and Bikaner account for a substantial part of the employment generated by such industries Recently Kota and Jodhpur are also in the front line In each of these districts the small units are naturally concentrated at the district headquarters where facilities of power, water supply and means of communications are provided

Targets of production are not generally fixed for the output from small units At the State level, the Plan Memorandum gives an account of only the developmental activities Accordingly, an appraisal of development in this area is possible only through State income estimates The State income estimates as prepared by the Directorate of Economics and Statistics, Rajasthan do not make distinction between modern and traditional small scale industries It has been estimated that while the percentage rise in the State income at current prices during the Third Plan (Base 1960 61) was of the order of 32 5, similar figure for factory establishments and small enterprises together was of the order of 26 5

In Rajasthan, the rate of growth of small industries had been lower than all India during the Third Plan On the basis of industries contribution to the State income, the rate of growth during the Third Plan period was of the order of 5 per cent The estimated structure of small scale sector in the State is given in Table 22 However it is expected that the performance of the State during the Fourth Plan period will be somewhat better

The Techno-Economic Survey of Rajasthan conducted by the National Council in 1960 61 listed a number of industries that could be taken up in the State in the small scale sector during the Third and Fourth Plan periods In the absence of relevant data it is not possible to evaluate the progress in the implementation of those recommendations

Development Potential 1966 71

In this section the development potential for each broad group of industries has been indicated first based on a macro approach to the problem Secondly, under each broad group a few industries which hold relatively brighter prospects have been specifically mentioned To a large extent these recommendations are substantially the same as those contained in the Techno-Economic Survey In a few cases however where it is known that the output for a few crops have since changed and the knowledge about resource availability in certain fields improved some changes have been effected in the previous recommendations

Agro Based Industries

The main agricultural crops of Rajasthan are wheat bajra maize and barley among food crops and cotton sugarcane and oilseeds among commercial crops Gaura or cattle feed is another important crop having use as an industrial raw material

The industries based on these raw materials as at present are mostly of traditional type There are not sufficient capacities to process the local produce and it would be more so consequent upon increased output of farm products anticipated during the Fourth Plan At present a substantial quantities of oilseeds major and minor foodgrains are exported outside the State

The future development in agro based small scale industries can be both by conversion of household and non household traditional units to modern small scale industries and through the increased availability of agricultural produce resulting from the Plan efforts

The National Council had suggested in its Techno Economic Survey three types of non traditional agricultural industries namely groundnut flour, tomato processing and canning and pop corn So far action on these schemes is pending During the Fourth Plan as a result of increased irrigational facilities growing of fruits and vegetables would expand This should lead to the establishment of units for processing and preservation of fruits and vegetables in the State and also cold storage units at a few places At present there are no such units in Rajasthan Other industries which have good prospects are oil expellers cotton ginning and bailing cattle feed units and khandsari units

The net output arising from the agro based industries by 1973 74 would be of the order of Rs 75 lakhs and the employment opportunities would be 6 500

Textiles

Although cotton textiles is an agricultural based industry due to its important place in the industrial structure it is discussed separately from the above group The indicator to its growth is the quantity of cotton produced within the State Demand for cotton textiles does not pose a problem at present Elsewhere in the Report an expansion of spindles for cotton yarn is suggested making more yarn available for handlooms and powerlooms The development during the Fourth Plan would come both through the conversion of handlooms into powerlooms and the putting up of new powerlooms The areas where this industry is likely to grow more are Bhilwara Chittor and Jhalawar The net output after this expansion is estimated around Rs 74 lakhs and the employment likely to be generated is 11 800

Forest Based Industries

Rajasthan is not rich in forests But recently minor forest produce, which the State has in plenty are becoming increasingly important for basing small scale industries There is scope for putting up saw mills and timber treatment plants in the Kota and Udaipur regions In Dungarpur and Jhalawar which have practically no industries at present, a few wood based industries could be established Bidi manufacture is another line that holds good prospects

The Techno Economic Survey listed two types of industries under this group packing cases and tool handles As the tool handle units have not come up the recommendation is reiterated Possible locations for them are Alwar, Chittorgarh, Sawai Madhopur, Kota the places where there is demand for the item and also where dry teak wood can be easily obtained from nearby places[1]

Materials that can be grown on scrub waste forest lands etc , can be processed in small scale units provided continuous research in their industrial uses and in markets is carried out In Rajasthan there is a case for setting up a regional research laboratory entrusted with such problems on the one hand and an agro industrial corporation to promote related industries on the other The recommended corporation could embrace within its scope of researh and development the four industry groups agro based textiles livestock based and forest based industries Of course each of these fields should have competent technical persons

It has not been found desirable to relate the development of forest based industries with a simple indicator as extension of area under forests etc The approach adopted is thus more influenced by feasibilities of individual industries The types of units that could be set up are packing cases card board units tool handles saw mills tooth picks and other industries based on bamboo These would give Rs 12 lakhs worth of net output and give employment to about 970 persons

Mineral Based Industries

Generally the first processing of minerals is done at the place of their occurrence In a way mineral based industries can be described as local and 'non shiftable The commonest mineral based industry in the small scale sector

[1] Banswara Udaipur and B[illegible]an Divisions are reported to have small dry teak forests

[2] As at present while leather and leather products under the group is carried on in the household or traditional non household sector workshops work are done in the large scale sector

is brick making And the indicator used to project its development prospects is the house building programmes

Although a little flexible pottery and ceramics industry may also be treated as of local nature But its development is highly influenced by incomes of the consumers This explains its pull towards cities and towns where more affluent members of the society reside

In Rajasthan mica grinding can be taken up in a big way There is considerable demand for the product in India and it can be exported also So far Rajasthan has only one mica brick making unit But it is not able to cope with the demand Expansion of this industry during the Fourth Plan can therefore be anticipated

Marble cutting and dressing is another field where the State might establish itself Four colours of marbles are available white black pink and grey Cutting and polishing of marbles is quite a labour intensive small scale local industry The waste (chips) in the process could also be used in distempers This has to be further investigated The National Council recommended a marble lime factory to be set up with a capacity of one ton per day And the plant has prospects of coming up during the next Plan period

During the Third Plan mineral based industries in Rajasthan did not develop to the extent the National Council recommended in its Techno-Economic Survey A shortfall of about two thirds is estimated in the net output arising from the group

Recently metal based industries have been facing bottleneck of foreign exchange scarce raw materials power and capital as such In this respect mineral based industries do not make long draft on any of these resources During the Fourth Plan in order to relieve unemployment and add to the total volume of production the State should plan for a rather ambitious programme of mineral based industries The types of industries which could come up in Rajasthan are mechanical brick making pottery and ceramics, mica grinding, dry, marble cutting and polishing marble lime and other industries like plaster of pari china clay washing micronising plants bentonite activation plant garnet dressing fullers earth activation calcium nitrate calcium chloride mosaic tiles, precipitated chalk, glass and glassware etc

Chemical Industries

Chemical based industries have not developed much in Rajasthan In 1960 61 they contributed 0 5 per cent of the total net output arising from the modern small scale sector The comparable figure for all India was 8 7

per cent (Table 21) In Rajasthan, there are quite a few soap (washing) making units scattered in urban areas But all of them were too small to cover in the sample part of the Annual Survey of Industries

The development of chemical based industries is generally found related to the overall development of small scale sector Partly because some of the items produced in them may be used in other lines of production and partly as they are influenced by increased incomes distributed by the growth of all industries

The National Council in its Techno Economic Survey envisaged an investment of Rs one crore for this group of industries during the 10 year period 1961 71 In the absence of relevant information it is difficult to say as to how much of it has gone through But this is likely to be less than one third of what was recommended in the Techno-Economic Survey

For the Fourth Plan it is suggested that a concerted effort be made to implement that programme Paints and varnishes is a promising field where half a dozen small scale factories can be started Plastics is another important line Both consumer and intermediate type of goods can be produced with not very heavy investments The demand for plastic consumer goods is generally dependent on increase in population and per capita income Besides there will be considerable supercession of other materials by plastic goods Of course there would be keen competition from other States particularly from Maharashtra and West Bengal but entrepreneurs with ideas and drive and aggressive salesmanship can succeed Other industries which could be taken up are soap metal polish boot polish, sodium silicate, etc

Metal Based Industries

Out of all groups metal based industies had a good record of growth during the Third Plan period This was in spite of the common difficulties of obtaining raw materials and power As is well known the tools and equipment in engineering plants are strictly speaking not product specific but job-specific and the process of production involves combining a number of jobs done on a large number of machines tools and instruments In Rajasthan the ingenuity of the technicians and entrepreneurs in a number of engineering units especially in industrial estates has helped in maintaining the tempo of growth in spite of the insufficient availability of requisite raw materials But, even then it is estimated that the progress could not keep pace with the recommendations contained in the Techno-Economic Survey It was about one fourth short during the Third Plan The main snag appears to be the poor development of component manufacturing units in the State

The two very broad sub-groups under metal based industries for consideration here are manufacturing and repairs Manufacturing can further be divided into manufacture of whole items and ancillary production

Till late small scale metal fabrication especially sheet metal has been the most common industry in the State Next to that was the manufacture of metal products except machinery and transport equipment Both these items employed about 660 persons in 1960 61 Manufacture of machinery except electrical machinery employed another 115 persons rest of the industries in the group being engaged mainly in repair work

Among manufacturing lines the fast movers would be those which serve agriculture The future of agricultural production and farming as such is very bright in the State Manufactured products going as inputs into agriculture and those processing the produce afterwards would have large demand The example for the first variety for consideration in the small scale sector is agricultural implements and of the latter *atta* (wheat flour) mills To subserve the requirements of horticulture barbed wires wire drawing and galvanizing have good scope

Metal based consumer goods industries to receive fillip with rising incomes of the people are steel furniture builders hardware kerosene stove, cookers padlocks mechanical toys bicycles etc It is difficult to enumerate all such items much more difficult would be to spell out their development potentials The machine tools factory being set up at Ajmer may induce a few ancillary units

The expansion of servicing activities relate to the increased use of mechanical instruments and appliances In the initial stages of development it relates to the expansion of (motor) road transport facilities as automobiles is perhaps the only mechanical appliances in use The servicing units in some cases also produce replacement parts needed for transport equipment, industrial machinery and durable consumer goods such as sewing machines electrical equipment etc

Following all India pattern this group of industries is likely to develop most The net output by 1973 74 is expected to be of the order of Rs 185 lakhs and give employment to 5 300 persons

MISCELLANEOUS

This group includes all industries that have not been covered so far Urban life creates all sorts of demands The people in cities by virtue of their higher incomes can well afford to spend on recreations and comforts Sports goods ice icecream aerated water and ready made garments are a few such items The spread of education also creates specialized demands In addition, al

though livestock based industries have not been shown above in a separate group because of their unimportant nature in the small scale sector in the base years yet in years to come a few tanneries, wool processing and spinning footwear manufacture, dairies and glue and gelatine units might come up

In view of increasing urbanization and incomes during the Fourth Plan, it may be expected that the net output arising from miscellaneous industries would increase to a figure of Rs 44 lakhs The investment required to achieve the additional net output of Rs 24 23 lakhs is estimated at Rs 58 lakhs And the total employment generated will be about 1 850

NON HOUSEHOLD TRADITIONAL INDUSTRIES

Although it was not intended to study non household small industries falling outside the purview of the National Sample Survey, yet in order to complete the picture regarding the investment involved and the development effort required by the Small Scale Industries organisation of the State, some estimates in this regard were considered necessary In fact the Directorate of Industries in States do not make any distinction between the small scale industries (modern) as discussed in this Report and small non household enterprises left out in the Annual Survey of Industries while going about their job of developmental assistance In fact some of the factory industries covered in the census part of A S I (Annual Survey of Industries) which invest less than Rs 5 lakhs[1] are also considered for help

This sector produces all sorts of goods which are being produced in the above defined modern small scale sector although the predominant line is of servicing The one possible difference would be the size of operation and type of equipments used And to distinguish them from household industries these could be termed as partly modern

To indicate development in this group of industries during the Fourth Plan period the rate of growth as anticipated by the Perspective Planning Division of the Planning Commission for small enterprises (household plus non household) and past performance have been taken into account On that basis, it is estimated that the net output from the group would rise to Rs 1,800 lakhs

Summing Up

The implications of development programme discussed above have been

[1] Rs 10 lakhs when they produce ancillary items

summarised in Table 23, which give the expected position in 1973 74 Allowing for the estimated achievement by 1968-69, the additional benefits from small industries may be expected as shown below during the Fourth Plan period

Additional net output (Rs crores)	6 75
Additional investment (Rs crores)	6 00
Additional employment (Nos)	80 000

Tables

Table x

List of Candidate Industries Suggested in Techno Economic Survey

(Rs crores)

Industries	*Annual capacity suggested in Techno Economic Survey for achievement by 1970 71*	*Capacity licensed after 1960 61*	*Investment to correspond to the suggested capacity in column 2*	*Investments likely to have been made to correspond to licensed capacity in column 3*
(1)	(2)	(3)	(4)	(5)
A *Metallurgical and Metal Based Industries*				
1 Basic Metal Products				
Copper	20 000 tonnes	21 000 tonnes/a	3 60	3 60
Lead and zinc Zn	60 000	18 000	8 00	2 50
Pb	32 000	Nil	—	—
2 Secondary Production of Steel				
Alloy and special steel	5 000	—	3 50	—
Rerolling (a)	20 000		0 50	0 20
(b)	20 000	5 400 tonnes	0 20	—
Steel pipes	3 000	—	0 20	—
Silico-manganese steel	24 000	—	3 00	—
3 Intermediate Engineering Products—Ferrous				
Cast iron sleepers and non pressure pipes	24 000	—	1.40	—
Cast iron spun pipes	40 000	—	1 20	—
Jobbing foundries	16 000	7 500 tonnes	1 13	0 66
Malleable iron castings	1 000	1 500	0 25	0 37
Steel castings	7 000	—	2 00	—
Steel forgings	9 000	—	1 50	—
4 Intermediate Engineering Products—Non ferrous				
Copper and brass tubes	600	—	0 15	—
Copper strips	2 000	—	0.43	—
Copper conductors and winding wires	4 250	—	1 20	—
Lead and zinc including sheets strips tubes etc	15 000	10 800 tonnes	3 30	2 10

(Continued)

Table 1 *(Contd)*

(1)	(2)	(3)	(4)	(5)
5 Mechanical and General Engineering Industries				
Steel structurals	45 000 tonnes	36 000 tonnes	2 85	2 40
Wagon building	6 000 wagons	875 wagons	3 90	0 60
Ball and roller bearings	7 2 millions nos	1 5 million nos	1.44	0 50
Industrial fasteners	3 000 tonnes	—	0 32	—
Points and crossings	1 500 nos	—	0 38	—
Tools and implements	10 000 nos	—	0 85	—
Metal-containers	4 000 tonnes	—	0 40	—
Pumps	20 000 nos	—	0 52	—
Machine tools	—	—	4 00	—
Bicycles	60 000 nos	—	0 30	—
6 Industrial Machinery				
Agricultural machinery	—	—	1 00	—
Rice dal and flour mill machinery	—	—	0 50	—
Shoe tanning and other miscellaneous machinery	—	—	0 50	—
Chemical plant and equipment	—	—	0 50	—
Constructional machinery	—	—	0 50	—
7 Electrical Engineering Industries				
Electricity meters	300 000 nos	78 000 nos	0 50	0 13
Electrical machinery and other instruments	—	—	1 00	—
Precision instruments	Rs 15 crores	Rs 12 crores	8 00	6 40
Manufacture of diodes	480 000 nos	—	0 50	—
Electric lamp caps	48 million nos	48 millions	1 00	1 00
Permanent magnets	120 000 nos	—	0 50	—
Fractional horse motors	3 600 nos	—	0 50	—
V I R cables	10 million core yards	—	0 40	—
Paper insulated power cables	600 miles	600 miles	2 00	2 00
A C S R conductors	1 500 tonnes	1 500 tonnes	0 14	0 14
Cotton silk and paper covered wires and strips	300 tonnes	—	0 05	—
TOTAL			*63 35*	—
8 *Agro-based Industries*				
Sugar (8 units)	8 000 tonnes per day crushing capacity	350 tonnes/day	10 80	0 70

(Continued)

Table 1 (Contd.)

(1)	(2)	(3)	(4)	(5)
Industrial alcohol	12 000 gallons/day	3 000 gallons/day	1 80	0 45
Cottonseed oil (4 units)	48 000 tonnes to be processed per year	20 000 tonnes/year	0 80	0 33
Solvent-extraction of oil cake	82 500 tonnes of cake per year	—	0 80	—
Textile spinning and weaving (20 units)	5 lakh spindles	2 5 lakh spindles	40 00	20 00
Oil mills	3 600 tonnes	—	0 10	—
Flour mills	75 000 tonnes/year	45 000 tonnes/year	0 55	0 33
C *Livestock based Industries*				
Woollen mills leather	2 million yards	2 2 million yards	0 25	0 27
	Rs 120 lakhs	—	0 10	—
Spinning woollen shoddy yarn	5 000 spindles	5 184 spindles	0 35	—
(a) Ossein	12 000 tonnes	—	1 00	—
(b) Dicalcium phosphate	9 000 tonnes	—	—	—
TOTAL			*1 70*	—
D *Forest based Industries*				
Integrated timber industry	—	—	0 90	—
Strawboard and paper	—	7 500 tonnes	2 10	2 10
TOTAL			*3 00*	—
E *Chemicals and Allied Industries*				
Nitrogenous fertilisers	160 000 tonnes of nitrogen	73 000 tonnes	52 00	26 00
Superphosphate	275 000 tonnes	—	1 00	—
Soda ash	66 000 tonnes	—	4 00	—
Caustic soda	35 000 tonnes	6 600 tonnes	3 50	0 60
Sodium sulphate	43 000 tonnes	—	1 60	—
Calcium carbide Polyvinyl chloride	27 000 tonnes 13 500 tonnes	9 000 tonnes 6 000 tonnes	4 20	1 75
Viscose rayon	6 600 tonnes		8 50	—
Barium chemicals				
Lithopane Blankfixe Barium chloride etc	6 000 tonnes 3 000 tonnes 3 000 tonnes	—	0 50	—
Cement	1 5 million tons	—	24 00	—
Glass	16 500 tonnes	—	1 00	—
Ceramics				
(i) Sanitary and domestic wares (ii) Stoneware tiles and L T insulators	[illegible] 000 tonnes	12 900 tonnes	0 [illegible]0	1 25

Table 3

Aggregate Picture of the Industrial Programmes for Rajasthan in the Fourth Plan

Industry groups	*Additional investment during the Fourth Plan* (Rs crore)	*Additional output by 1973 74* (Rs crores)	*Additional employment opportunities by 1973 74* (Nos)	*Additional power requirement by 1973 74* (kW)	*Additional transport requirement by 1973 74* ('000 tonnes)
Mining industries and mineral development	[illegible]7 17	10 00	15 200	40 000	8 000
Metallurgical and metal based industries	68 [illegible]9	15 97	15 200	31 7[illegible]0	311
Mineral based industries (Non metallurgical)	27 [illegible]3	6 48	13 7[illegible]0	5 700	2 514
Agriculture livestock and forest based industries	16 95	7 8	25 450	51 800	[illegible]99
Chemical and allied industries	[illegible]6 02	6 40	7 040	55 900	689
Small industries	6 00	6 7[illegible]	80 000	40 000	300
TOTAL	*172 26*	*53 42*	*156 640*	*272 150*	*12 413*

Table 4

Shares of Private and Public Sector Investments in Industries in Rajasthan During the Fourth Plan

(Rs crores)

Groups and Sl No	Industries	Central Government	State Government	Private sector	Total
(1)	(2)	(3)	(4)	(5)	(6)
I	*Mining Industry and Mineral Development*				
1	Mineral exploration	—	1 00	—	1 00
2	Copper lead zinc ores	18 00	—	—	18 00
3	Lignite	—	4 50	—	4 50
4	All others	—	—	3 67	3 67
	TOTAL	*18 00*	*5 50*	*3 67*	*27 17*
II	*Metallurgical and Metal based Industries*				
1	Copper zinc cadmium and silver	55 00	—	—	55 00
2	Machine tools	1 00	—	—	1 00
3	All others	—	—	12 89	12 89
	TOTAL	*56 00*	—	*12 89*	*68 89*
III	*Mineral based Non Metallurgical*				
1	All industries	—	—	27 23	27 23
IV	*Industries Based on Agriculture Livestock and Forests*				
1	Textiles cotton	—	4 20	4 20	8 40
2	Sugar	—	—	1 25	1 25
3	Woollen tops yarn and cloth	—	2 00	1 88	3 88
4	All others	—	—	3 42	3 42
	TOTAL	—	*6 20*	*10 75*	*16 95*
V	*Chemicals and Allied Industries*				
1	Phosphatic fertilizer	14 50	—	—	14 50
2	All others	—	—	11 52	11 52
	TOTAL	*14 50*	—	*11 52*	*26 02*
VI	*Small scale industries*	—	—	6 00	6 00
	GRAND TOTAL	**88 50**	**11 70**	**72.06**	**172 26**

Table 5

Mineral Production in Rajasthan 1960 64

(Value n Rs 000)

Mineral	*Unit quantity*	*1960*		*1961*		*1962*		*1963*		*1964*	
		Quantity	*Value*	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*	*Quantity*	*Value*
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Lignite	Tonnes	42 224	8 99	56 687	12 09	35 079	8 62	4 544	58	1 205	29
Lead concentrate	,	6,245	22 31	5 532	16 91	6 384	23 25	5 920	20 13	6 130	39 85
Zinc concentrate		9 787	5 44	9 254	22 12	9 837	27 16	10 627	28 64	10 744	46 60
Silver	Kgs	3 768	7,12	5 572	11 21	3 941	8 38	3 680	8 41	4 383	10 99
Iron ore		125 425	11 99	89 033	8 08	89 85	8 53	67 079	6 12	35 087	4 04
Manganese ore		5 608	1 51	3 861	1,12	2 826	66	—	—	1 062	21
Asbestos	,	1 033	37	1 184	77	1 320	63	2 133	1 01	2 411	1 16
Barytes		1 314	26	1 237	25	2 353	38	5 289	90	9 365	1 70
Calcite		4 260	28	4 136	40	5 5 6	56	4 953	49	4 893	60
Chinaclay (Crude sold as such + washed)	,	1 224	6	2 040	40	2 325	53	6 848	1 66	6 37	1 61
Dolomite	,	638	3	6 220	25	9 729	42	10 528	46	10 333	44
Emeralds (Crude)	000 carats	322	N A	295	N A	352	N A	386	N A	53	N A
Emeralds (*Dressed*)		59	58	38	92	87	218	192	73	80	50
Feldspar	Tonnes	8 747	92	6 646	68	12 165	124	14 071	1 51	12 000	1 31
Fluorite		—	—	120	13	340	33	358	35	224	8
Garnet	,	230	14	241	15	426	18	401	17	295	20
Gypsum		914 7 8	53 14	789 881	45 15	1 033 742	57 12	1 082 929	58 89	758 191	50 39
Kyanite		—	—	16	1	—	—	59	5	37	3
Limestone		1 588 902	63 6	1 649 841	40 63	1 694 771	44 13	1,736 593	51 89	1 717 790	58 21
Mica (Crude)	,	7 326	52 79	7 650	53 94	7 420	68 76	6 970	63 51	5 470	48 42
Ochre		43	1	65	2	14	—	1 04	5	105	6
Quartz silica Sand		21 546	2 13	34 337	3 56	36 420	4 08	45 193	4 41	52 293	5 77

(*Continued*)

Table 5 (*Contd*)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Steatite	Tonn s	78 033	8 83	78 075	26 80	87 751	31 58	97 338	32 53	112 8 6	34 18
Vermiculite		—	—	—	—	61	2	312	14	5[illegible]	2
Salt		307 262	62 87	2,50 000	51 84	384 300	88 11	436 400	1 13 58	3,50 800	49 76
TOTAL MINOR MINERALS (GROSS VALUE)		—	*3 10 32*	—	*3 55 06*	—	*4 00 10*	—	*4 25 27*	—	*5 59 61*
TOTAL RAJASTHAN (GROSS VALUE)		—	*6 53 70*	—	*6 52 62*	—	*7 77 51*	—	*8 22 44*	—	*9 17 14*
TOTAL INDIA (GROSS VALUE)		—	**1,64 75 62**	—	**1 80 54,16**	—	**2 07 99 58**	—	**2 50,29 93**	—	**2,40 03,92**

SOURCE —Indian Bureau of Mines *Indian Minerals Year Book* 1964

Table 6

Mineral Production—Rajasthan and India (1964)

Mineral	*Unit*	*India*	*Rajasthan*	*Rajasthan as a proportion of India* (Per cent)
Lignite	Tonnes	1 [illegible]69 000	1 205	0 08
Lead concentrate		6 130	6 130	100 0
Zinc concentrate		10 744	10 744	100 0
Silver	Kgs	4 735	4 383	93 0
Asbestos	Tonnes	3 366	2 411	72 0
Barytes		46 959	9 365	19 9
Calcite		13 906	4 893	35 1
Emeralds (Dressed)	Carats	80 000	80 000	100 0
Feldspar	Tonnes	24 382	12 0[illegible]0	49 6
Gypsum		882 000	758 191	85 5
Limestone		17 017 000	1 717 790	10 1
Mica (Crude)		22 806	5 470	24 0
Steatite		133 820	112 826	84 5
Minor minerals	Rs 000	311 743	55 [illegible]61	17 9

Table 7

Production of Lead Zinc Ore and Concentrates

Year	Run of mine ore: Produced (Tonnes)	Run of mine ore: Treated (Tonnes)	Run of mine ore: Metal content Pb (Per cent)	Run of mine ore: Metal content Zn (Per cent)	Total (Per cent)	Lead concentrate: Produced (Tonnes)	Lead concentrate: Metal content Pb (Per cent)	Lead concentrate: Metal content Zn (Per cent)	Zinc concentrate: Produced (Tonnes)	Zinc concentrate: Metal content Zn (Per cent)	Zinc concentrate: Metal content Pb (Per cent)
[illegible]	[illegible]	14[illegible]	3 66	4 53	8 19	6 488	73 77	N A	9 978	54 56	N A
[illegible]	152 3[illegible]	146 702	3 32	4 32	7 [illegible]4	6 24[illegible]	72 5	5 7	9 787	53	1 09
[illegible]	[illegible]227	148 430	2 96	4 03	6 9[illegible]	5 532	73 4	5 9	9 254	[illegible]5 3	1 65
[illegible]	[illegible]3	153 [illegible]	3 32	4 33	7 65	6 394	71 98	6 25	10 0 4	[illegible]5 2	1 3
[illegible]	153 122	153 3[illegible]	3 [illegible]7	4 46	7 53	5 920	72 9	5 64	10 627	55 14	1 52
[illegible]	174 181	16[illegible]	3 07	4 29	7 36	6 130	73 3	4 96	10 744	55 11	1 03

SOURCE —Indian Bureau of Mines *Indian Minerals Year Book*

Table 8

Estimated Ex Factory Production Cost of Sulphuric Acid for Plants at Source of Sulphur Pyrites and Gypsum (in Rs /tonne of acid) [a]

Scale of production of acid per day (In tonnes)	Sulphur at port of entry price at [b,a,c]			Pyrites price at			Gypsum price [d] at 12/tonne
	Rs 225/ tonne	Rs 247/ tonne	Rs 300/ tonne	Rs 35/ tonne	Rs 52 50/ tonne	Rs 80/ tonne	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
100	117 50	125	143	100	116	141	—
200	112 50	120	131	76	92	117	103[e]
500	104 50	112	123	59	75	100	92[f]

[a] Assumes manufacture of acid at port in the case of imported sulphur and near mine sites in the case of pyrites and gypsum

[b] Costs estimated after Kharbanda O P 1963 Techno Economic Aspects of Sulphuric Acid Industry in India *Thermical Age of India* Vol 14 No 1 1963 pp 48 and 50

[c] Costs of production have been recalculated in columns (2) (4) (5) and (7) after Kharbanda *op cit* to allow for different price levels for imported sulphur and pyrites

[d] After Poddar V 1962 *Cement I dustry in India* pp 137 143

[e] For a scale of production of 300 tonnes of acid per day

[f] Recalculated after Poddar *op cit* for a scale of production of 600 tonnes of acid per day

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Table 9

Anticipated Mineral Production in Rajasthan 1970-71

(Quantity in tonnes)
(Value in Rs '000)

	1965	1973-74 (Estimated)	
	Quantity	Quantity	Value
Lignite	[illegible]	500 [illegible]	11 [illegible]
Copper ore[a]	—	[illegible]	[illegible]
Lead zinc ore[a]	[illegible]	[illegible]	8 [illegible][b]
Iron ore	12 [illegible]	50 [illegible]	[illegible]
Fluorite[a]	[illegible]	[illegible]	[illegible]
Gypsum	[illegible]	[illegible]	[illegible]
Limestone	[illegible]	[illegible]	[illegible]
Mica	[illegible]	[illegible]	6 000
Asbestos	4 000	[illegible]	[illegible]
Barytes	[illegible]	[illegible]	[illegible]
Calcite	[illegible]	[illegible]	[illegible]
China clay	[illegible]	[illegible]	343
Felspar	[illegible]	[illegible]	916
Quartz silica	[illegible]	[illegible]	[illegible]
Steatite	[illegible]	[illegible]	5 835
Others—Major minerals[c]	—	—	[illegible]
Minor minerals	—	—	[illegible]
Total Gross Value	—	—	[illegible]
Total Net Value	—	—	[illegible]

[a] Run of mine ore

[b] Includes value of [illegible] recovered also

[c] Includes [illegible] and manganese ore wollastonite dolomite [illegible] garnet [illegible] ochre and [illegible]

Table 10

Additional Output Investment and Employment in the Fourth Plan

Mineral	*Additional output* (Tonnes per year)	*Additional investment* (In Rs lakhs)	*Additional employment* (No of persons)
Lignite	500 000	4 50[a]	500
Copper ore	3 125 000	13 00[b]	3 500
Lead zinc ore	750 000	5 00[b]	1 000
Flourite	90 000	80[b]	300
Limestone	2 550 000	1 60	2 400
Wolfram	—	27[c]	—
Other minerals—major and minor	—	1 00	7 500
TOTAL		*26 17*	
Mineral exploration at 10 per cent of 1963 value of mineral production		1 00	
TOTAL		27 17	15 200

[a] Includes Rs 50 lakhs for underground gasification trials for lignite
[b] Includes investment on mine and mill
[c] A provisional investment awaiting the results of the investigation underway

Table 11

List of Metal Products

1 Agricultural implements
2 Bolts, nuts, rivets and dogspikes
3 Hurricane lanterns, torches and oil pressure lamps
4 Machine screws
5 Wood screws
6 Needles
7 Razor blades
8 Small tools and hand tools
9 Conduit pipes
10 Expanded metal
11 Enamel ware
12 Fire extinguishers
13 Welding electrod
14 Wire ropes
15 Drums and containers
16 Abrasive tools
17 Stoves
18 Cutlery
19 Utensils
20 Steel furniture
21 Builders hardware
22 Clocks
23 Spring chains, zips etc
24 Bright bar shafting
25 Crown corks
26 Trunks and buckets
27 Wheel barrows, platform trolleys etc
28 Collapsible gates and grills
29 Wire netting
30 Mechanical toys
31 Locks
32 Wire nails

Table 12

Machinery, Except Electrical—All India Targets and Sanctioned Capacities

	Industry	Unit	Sanctioned capacities	1973 74 Target	Apparent gap	Apparent excess
	(1)	(2)	(3)	(4)	(5)	(6)
1	Coal and other mining machinery	Thousand tonnes	59	11	—	48
2	Cotton textile machinery	Rs crores	70 0	55 0	—	15 0
3	Sugar machinery		17 2	14 0	—	3 2
4	Cement		23 0	7 0	—	16 0
5	Paper		16 0	9 0	—	7 0
6	Printing		4 8	1 3	—	3 5
7	Equipment for chemical industry		17 7	10 0	—	7 7
8	Heavy plate and vessel works	Thousand tonnes	23	13	—	10
9	Metallurgical and other heavy equipment		92	56	—	36
10	Dairy machinery	Rs crores	2 6	2 2	—	0 4
11	Tea processing machinery		2 14	2 6	0 46	—
12	Building and road construction machinery		10 0	7 8	—	2 2
13	Power boilers	Thousand tonnes	173	135	—	38
14	Industrial boilers	Rs crores	16 9	13 2	—	3 7
15	Tractors agricultural	Thousand nos	30	48	18	—
16	Diesel engines stationary		120	256	136	—
17	Power driven pumps		300	85	—	15
18	Air compressors	Rs crores	11 5	10 5	—	1 0
19	Machine tools		75 0	108 0	33 0	—
20	Crawler tractors	Nos	1 140	500	—	640
21	Shovels and excavators		142	117	—	25
22	Dumpers and scrappers		60	300	240	—
23	Road rollers		2 280	1 380	—	900
24	Grinding wheels	Tonnes	7 620	7 240	—	380
25	Instruments	Rs crores	4 8	32 0	27 2	—
26	Steel pipes and tubes	Thousand tonnes	746 6	490	—	256 6
27	Cranes		25 6	42	16 4	—
28	Typewriters	Thousand nos	141 4	98	—	43 4
29	Sewing machines		470	645	175	—
30	Watches clocks and time pieces		1 300	2 000	700	—
31	Ball and roller bearings	Million nos	19 6	26	6 4	—
32	Petrol/kerosene engines	Thousand nos	62 8	24	—	38 8
33	Machine tools—accessories	Rs crores	1 3	3 2	1 9	—
34	Portable tools		0 1	0 6	0 5	—
35	Reduction gears		6 0	1 8	—	4 2
36	Lifts	Nos	440	620	180	—

(Continued)

Table 12 (Contd)

(1)		(2)	(3)	(4)	(5)	(6)
37	Rice dal and flour mill and oil mill machinery	Rs crores	5	1 6	—	3 [illegible]
38	Tractor-drawn implements	Th nos	10	13	3	—
39	Drilling machinery	Rs crores	3 87	2 8	—	[illegible]
40	Conveying machinery		[illegible]	6	—	3 [illegible]
41	Fans and blowers	Thousand nos	21 9	7	—	14 9
42	Bolts nuts and rivets	Thousand tonnes	60	12	6	—
43	Agricultural implements		31 5	66	—	31 5
44	Fork lift trucks	Nos	4 375	16	—	3 [illegible]
45	Weighing machinery	Rs crores	1 8	3 1	1 3	—
46	Calculators	Thousand nos	44 4	13	—	[illegible] 4
47	Duplicators		[illegible]	[illegible]	—	[illegible]

Table 13

Electrical Machinery—All India Targets and Sanctioned Capacities

Industry	Unit	Sanctioned capacities	Target	1973 74 Apparent gap	1973 74 Apparent excess
(1)	(2)	(3)	(4)	(5)	(6)
Turbo generators					
—Steam	MW	2 900	1 [illegible]40	—	1 660
—Hydro	MW	1 700	900	—	800
Transformers	Mill KVA	12 2	11	—	1 2
Motors	MW	2 760	4 500	1 740	—
Control gear and switch gear	Rs crores	N A	36 4	a	a
House service meters	Thousand nos	1 853	2 280	4 7	—
VIR and PVC cables	Million	1 052	520	—	532
ACSR conductors	Thousand tonnes	94 7	70	—	24 7
Winding wires		6	6	—	—
Paper insulated cable	Km	25 500	2 600	—	2 900
Arc welding electrodes	Million metres	385	4 0	—	165
Air conditioners	Thousand nos	38 9	32	—	6 9
Water coolers		4 8	6 4	1 6	—
Refrigerators		53 8	6	8 [illegible]	—
Electric fans	Mill nos	1 7	1 94	0 24	—
Dry batteries		481 5	320	—	161 5
Storage batteries	Th nos	915	1 300	385	—
Electric lamps	Mill nos	179 [illegible]	14	34 8	—
Fluorescent lamps	Mill nos	12 5	13	0 5	—
Radio receiver	Th nos	709	1 420	711	—

[a] Reported enough capacity already created

Table 14

Metallurgical and Metal based Industries—Recommendations and Implications

Industry sub group and industries	Units for capacities	Additional capacities: Expansion	Additional capacities: New units	Additional capacities: Total	Additional investment (Rs crores): For expansion	Additional investment (Rs crores): For new units	Additional investment (Rs crores): Total	Additional net output (Rs crores)	Additional employment (Nos)	Additional power (kW)	Additional transport (000 tonnes)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
A *Basic Metal Industries*											
1 Copper ingot	000 tonnes	—	31	31	—	4[illegible] 00	4[illegible] 00	4 00	2 500	4 500	80
2 Zinc ingot		20	—	20	10 00	—	10 00	1 00	2 500	11 000	50
3 Cadmium[a]	Tonnes	75	—	75	—	—	—	—	—	—	—
4 Silver[a]	000 kgs	11	—	11	—	—	—	—	—	—	—
5 Lead ingot	000 tonnes	—	11	11	—	2 7[illegible]	[illegible] 7[illegible]	0 40	1 250	[illegible] 000	6
B *Secondary Products of Steel and Other Metals*											
1 Steel wires	Tonnes	—	5 000	5 000	—	0 33	0 33	0 17	[illegible]0	[illegible]00	10
2 Copper and brass tubes		—	1 000	1 000	—	0 10	0 10	0 04	40	100	3
3 Zinc sheets and strips		—	5 000	5 000	—	0 40	0 40	0 15	100	400	16
C *Metal Products*											
1 Industrial fasteners (bolts and nuts)	000 tonnes	—	10	10	—	0 60	0 60	0 [illegible]0	400	[illegible]00	[illegible]
2 Agricultural implements	Tonnes	—	2 500	2 [illegible]00	—	0 11	0 11	0 1[illegible]	[illegible]0	50	[illegible]
D *Machinery Except Electrical*											
1 Machine tools[b]	Rs crores	—	5 0	5 0	—	1 00	1 00	2 41	4 [illegible]00	4 200	26
2 Machine tools accessories		—	1 0	1 0	—	1 00	1 00	0 42	150	300	6

(Continued)

Table 15

Progress in the Glass Industries in India in the Third Plan

Type of glassware	*Unit of quantity*	*Estimated demand in 1965 66*	*Capacity[a] targeted in 1965 66*	*Capacity licensed*	*Capacity installed in 1965*	*Production* 1961	1962	1963	1964	1965
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Flat glass sheet	000 sq metres	17 522	21 r02	24 ,80	18 900	6 ,80	8 748	9 840	9 360	8 136
Bottles and vials	Tonnes	03 200	294 640	208 000	22 067	113 600	117 000	1 0 300	13 416	153 096
Table and pressedware		66 040	91 440	—	91 93	31 600	32 0	41 118	38 398	41 8 8
Lampware		30 480	44 704	—	51 085	18 600	18 000	19 03	16 1,0	16 443
Scientificware		15 240	22 352	—	15 091	3 40	4 330	4 513	3 669	5 462
Vacuum flasks		2 743	4 064	—	3 720	940	880	975	1 046	1 188
Glass shells		3 353	5 080	—	3 150	3 500	3 540	2 427	2 06	3 042
Miscellaneous ware		4 384	35 60	—	8 444	9 030	6 600	6 ,85	6 690	5 573

[a] Planning Commission *Programmes of Industrial Development* 1961 66 pp 5 4 and 555

Table 16

Mineral based Industries Non Metallurgical—Recommendations and Implications

Industry	Unit for capacities	Additional capacity: Expansion	Additional capacity: New unit	Total	Additional investment: Expansion	Additional investment: New unit	Additional investment: Total	[illegible]	[illegible]	[illegible]	[illegible]
(1)	(2)	(3)	4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Portland cement	000 tonnes	—	[illegible]	[illegible]	—	[illegible]		[illegible]	[illegible]	[illegible]	[illegible] [a]
Cement cum		—	[illegible]	[illegible]	—	[illegible]	3	[illegible]	[illegible]	[illegible]	[b]
Sulphuric acid		—	[illegible]	[illegible]							
White cement cum		—	[illegible]	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
Sulphate of potash	Tonnes	—	[illegible]	[illegible]							
Micanite		—	3	3	—	[illegible]	[illegible]	[illegible]	3	[illegible]	5
Wet ground mica		—	[illegible]	[illegible]							
Glass architectural building blocks		—	[illegible]	[illegible]	—	[illegible]	3	3	[illegible]	[illegible]	
Synthetic cryolite and aluminium fluoride	000 tonnes	—	6	[illegible]	—	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
TOTAL	—	—	—			[illegible]	[illegible]	[illegible]	[illegible]	5 [illegible]	[illegible]

[a] Since location is near quarry lime stone transportation is not included

[b] Since location is near quarry gypsum transportation is not included

Table 17

Industries Based on Agriculture Livestock and Forests—Recommendations and Implications

	Industry	Units for capacities	Additional capacities: Expansion	Additional capacities: New units	Additional capacities: Total	Additional investment (Rs crores): For expansion	Additional investment (Rs crores): For new units	Additional investment (Rs crores): Total	Additional output (Rs crores)	Additional employment (Nos)	Additional power (kW)	Additional transport (000 tonnes)
A	*Agriculture based Industries*											
1	Cotton yarn	000 spindles	100	100	200	3 00	3 60	6 60	2 00	8 500	25 000	100
2	Cotton textiles	looms	—	1 200	1 00	—	1 80	1 80	0 50	1 500	4 200	10
3	Sugar	Tonnes per day crushing	—	1 250	1 250	—	1 25	1 25	0 60	2 600	400	36
4	Flour milling	000 tonnes	—	180	180	—	0 49	0 49	0 44	700	500	200
5	Oil milling	000 tonnes	—	0	20	—	0 12	0 12	0 12	100	250	80
6	Solvent extraction of oil cake	Tonnes	—	3 000	3 000	—	0 10	0 10	0 10	200	100	12
7	Vana pati	Tonnes	—	6 000	6 000	—	0 33	0 33	0 14	200	350	10
B	*Livestock based Industries*											
1	Tanning	Million hides	—	0 5	0 5	—	0 18	0 18	0 09	50	[illegible]00	1
2	Milk products	—	—	—	—	—	0 20	0 [illegible]0	0 10	100	100	1
3	Woollen textiles	Million kgs	—	6 0	6 0	—	2 60	2 60	1 50	5 000	1 000	10
	(a) Wool tops		—	500	[illegible]00	—	0 08	0 08	0 05	00	450	1
	(b) Spinning unit for shoddy yarn	Spindles	—	1 000	1 000	—	0 60	0 60	0 42	2 000	[illegible] 000	10
	(c) Composite mill	Spindles	—	00	00	—	0 30	0 30	0 21	1 000	2 500	5
		Looms	—	—	—	—	—	0 30	0 20	1 000	2 500	10
	(d) Carpet weaving	Looms	1 50	—	1 250	0 30						
	(e) Woollen yarn	Spindles										
C	*Forest based Industries*											
1	Paper and pulp	Tonnes	—	3 000	3 000	—	0 80	0 80	0 50	900	3 50	39
	Chip board		—	6 000	6 000	—	0 20	0 0	0 10	200	1 00	18
3	Straw board		—	4 500	4 500	—	1 00	1 00	0 75	1 [illegible]00	4 800	58
	TOTAL		—	—	—	*3 30*	*13 65*	*16 95*	*7 82*	*25 450*	*51 800*	*599*

Table 18

Chemical and Allied Industries—Recommendations and Implications

Industry	Unit for capacities	Additional capacity: For expansion	Additional capacity: New unit	Additional capacity: Total	Additional investment (Rs crores): For expansion	Additional investment (Rs crores): For new unit	Additional investment (Rs crores): Total	Additional output (Rs crores)	Additional employment (Nos.)	Additional power (kW)	Additional transport for (000 tonnes)
A Fertilisers											
1 Phosphatic	000 tonnes P_2O_5	1 2 0	1?0*	11 0	1 0	13 00	14 0	3 60	3 000	10 000	400
B Alkalis											
1 Caustic soda	Tonnes	6	—	6 5 0	2 40	—	2 40	0 6	1 220	39 000	80
2 Soda ash	Tonnes per day	—	00	200	—	4 75	4 75	0 75	1 300	1 00	165
C Other Industries											
1 Processing of plastics	Rs crores		75	0 75	—	2 00	2 00	0 40	00	1 0 0	10
2 Barium chemicals	Tonnes		4 00	4 000	—	0 17	0 17	0 09	70	400	2
3 Pigment [illegible] tonnes of lithopone and [illegible] tonnes of zinc oxide	Tonnes	—	0 0	9 000	—	1 50	1 50	0 75	7 0	3 7 0	22
4 Synthetic detergents	Tonnes	—	4 000	4 000	—	0 70	0 0	0 25	00	00	10
TOTAL	—	—	—	—	3 90	22 12	26 02	6 40	7 040	55 900	689

* Kle u Ir ect Fer lzer Unit

Table 19

Industrial Structure in Rajasthan and India in 1960 61

Sl no		All India		Rajasthan	
		Employment	Net output in Rs 000	Employment	Net output in Rs 000
(1)	(2)	(3)	(4)	( )	(6)
1	Household manufacture	9 740 7[illegible]2 (54 5)	31 90 393 (16 9)	337 929 (65 [illegible])	58 124 (22 6)
2	Non household small				
	(a) Traditional	4 216 324 (23 6)	48 75 241 ([illegible]5 8)	119 023 (23 0)	84 030 (3[illegible] 7)
	(b) Modern	739 707 (4 1)	14 07 718 (7 4)	11 [illegible]62 (2 [illegible])	13 963 (5 [illegible])
3	Large scale	3 190 66[illegible] (17 8)	94 22 634 (49 9)	50 [illegible]87 (9 6)	100 574 (39 2)
	TOTAL INDUSTRY SECTOR	*17 887 418 (100 0)*	*188 95 986 (100 0)*	*518 501 (100 0)*	*256 691 (100 0)*

NOTES —1 Figures within brackets denote percentages

2 Figures given for large scale manufacture have been corrected for non response

SOURCE — NCAER 1964 *Income and Structure of Manufacturing Industry 1960 61* Occasional Paper No 8

Table 21

Structure of Small Scale Industries in India in 1961

Sl No	*Industry group*	*Employment* ('000)	*Net output* (Rs crores)
1	Agro based	209	40 9
2	Forest based	28	7 7
3	Chemicals	29	12 6
4	Mineral based	19	5 0
5	Metal based	134	37 1
6	Textiles	134	24 1
7	Miscellaneous (Including livestock based)	67	18 4
	SUB TOTAL	*620*	*145 8*
	NON HOUSEHOLD SMALL ENTERPRISES	*4 216*	*487 5*
	GRAND TOTAL	**4 836**	**633 3**

Table 22

Structure of Small Scale Industries in Rajasthan in 1965 66 (Estimated)

	Industry group	*No. of persons employed*	*Net output (Rs ['000])*
1	Agro based	2 6[illegible]	3 1[illegible]3
2	Forest based	3[illegible]4	416
3	Chemicals	166	672
4	Mineral based	1 26[illegible]	2 377
5	Metal based	1 250	3 17[illegible]
6	Textiles	3 7[illegible]	3 920
7	Miscellaneous (Including livestock based)	[illegible]5	1 [illegible]68
	SUB TOTAL	*10 400*	*16 000*
	NON HOUSEHOLD SMALL ENTERPRISES	*150 000*	*106 000*
	GRAND TOTAL	160 400	122 000

Table 23

Structure of Small Scale Iudustries in Rajasthan in 1973 74 (Estimated)

	Industry group	*No of persons employed*	*Net output* (Rs lakhs)
1	Agro based	6 [illegible]00	7[illegible] 0
2	Forest-based	970	12 0
3	Chemicals	1 150	30 0
4	Mineral based	3 230	75 0
5	Metal based	5 300	185 0
6	Textiles	11 800	74 0
7	Miscellaneous (Including livestock based)	1 [illegible]50	44 0
	SUB TOTAL	*30 800*	*495 0*
	NON HOUSEHOLD SMALL ENTERPRISES	*255 000*	*1 800 0*
	GRAND TOTAL	**285 800**	**2 295 0**

Appendix

Project Director

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Shri S Sarangapany

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Also by NCAER

Underutilization of Industrial Capacity

THE PROBLEM OF underutilization of industrial capacity in India has assumed an urgency of its own in the context of the persisting foreign exchange difficulties Yet there seems to be no clear idea of the extent of underutilization in our industries This study offers an estimate of underutilization in five major groups—metal products, machinery other than electrical, electrical machinery, transport equipment and chemicals and chemical products

The underutilization percentages in these groups have been calculated on the actual as well as the desirable number of shifts The more important factors responsible for underutilization have been indicated and possibilities of increased production have also been suggested

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